THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK NOVEMBER, 1910

A Modern Heating and Ventilating System for an Old Church Building

PLANT INSTALLED IN THE BRICK PRESBYTERIAN CHURCH, NEW YORK

The Brick Presbyterian Church, at Fifth Avenue and Thirty-seventh Street, New York, is probably one of the best known church buildings in the East. It was built before the Civil War and has at various times been remodeled and added to until it stands to-day as one of the best examples of the English classic architecture to be found in the city. Its interior decorations executed by LaFarge contain some of the artist's most notable designs and the church's main auditorium has been pronounced by experts to be the most pleasing interior of any church in the metropolis.

During this entire period, however, the church has been without any adequate method of ventilation. As a result the spaces directly below the galleries, which extend on both sides of the auditorium, have always formed pockets for stagnant air, while the large windows above the galleries have caused down drafts of cold air in the main floor and have proved most troublesome and annoying.

The building was heated by two warm-air furnaces and ordinary ventilators were located in the roof directly above the main floor.

The present system of heating and ventilation, which is illustrated herewith and which has just been installed, was designed to overcome the objectionable features referred to as well as to provide for an even distribution of fresh warm air in every part of the church.

With these ends in view, a low pressure heating system was adopted, with direct and indirect radiation. Direct radiation is used in all of the entrance halls and in the rooms of each story in the chapel, which directly adjoins the church in the rear. There are also direct radiators enclosed in recesses under the first-story windows and behind the window railings in the galleries, to take care of the exposed glass surface at these points.

Supplemental indirect stacks are located below the floor of the main auditorium and of the principal rooms in the chapel, independent of the fan system. Connections are made from the fans to separate fresh air openings placed at the ends of every pew in the church. The course of the incoming air is, therefore, upward, passing out of the church through small grilles at the top, whence it flows out through the main tower above the main entrance. The tower has been found to furnish a powerful draft and so far it has not been necessary to install fans or aspirating coils to accelerate the outward flow of air.

The plant is designed to warm the church to 65°, the organ motor room

to 80° and all the other rooms to 70° in zero weather. The ventilating system alone supplies 14,400 cu. ft. of warmed air per hour.

DESCRIPTION OF PLANT

The heating system comprises two 60 H. P. boilers of the Scotch-marine type, each boiler being 72 in. in diameter and 10 ft. long, with 480 sq. ft. of heating surface. The system is designed to operate on 2 lbs. pressure, and the building to be heated to the desired temperature on 5 lbs. pressure.

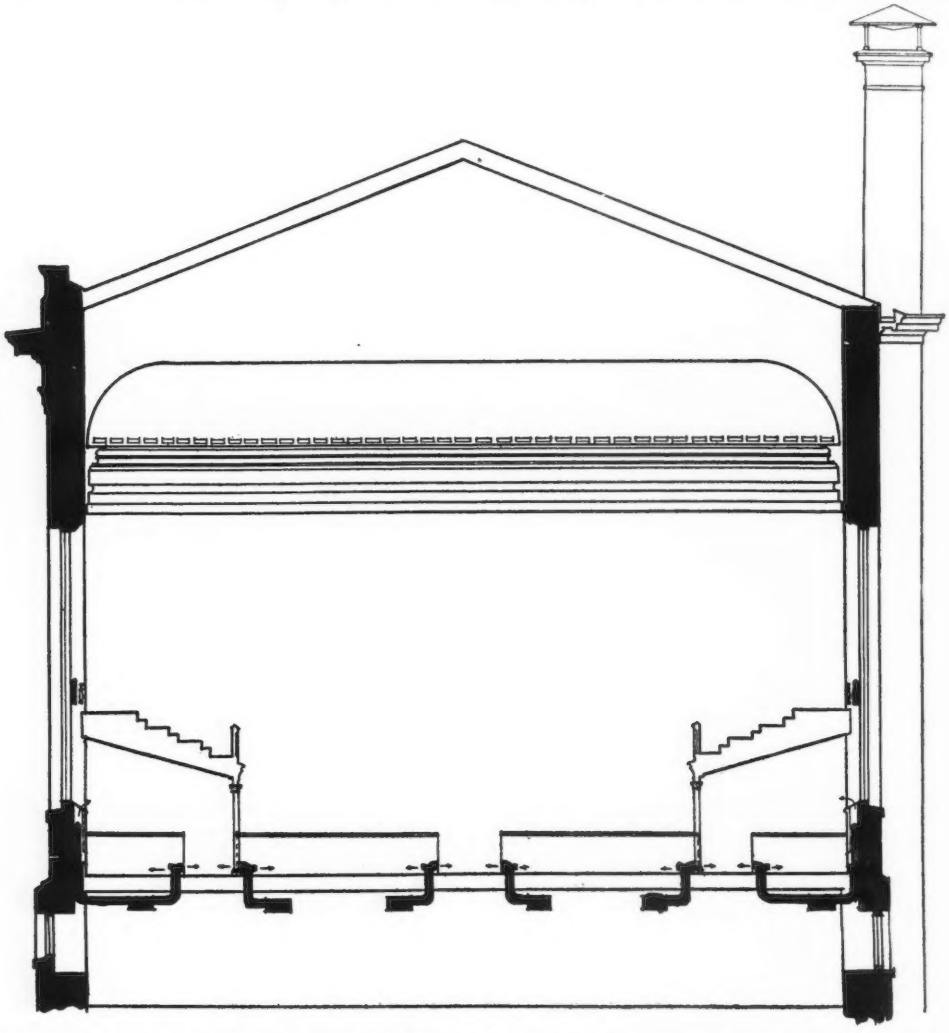
The steam mains and branches are suspended from the cellar ceiling and the return mains and branches are run generally along the walls at the floor.

The radiators in the gallery are connected to a single steam pipe located along the base-board near the floor and extending from one end of the gallery to the other; these radiators are 1-col. Peerless mounted on supports in such a way as not to obstruct the openings between the gallery floor and the window sash.

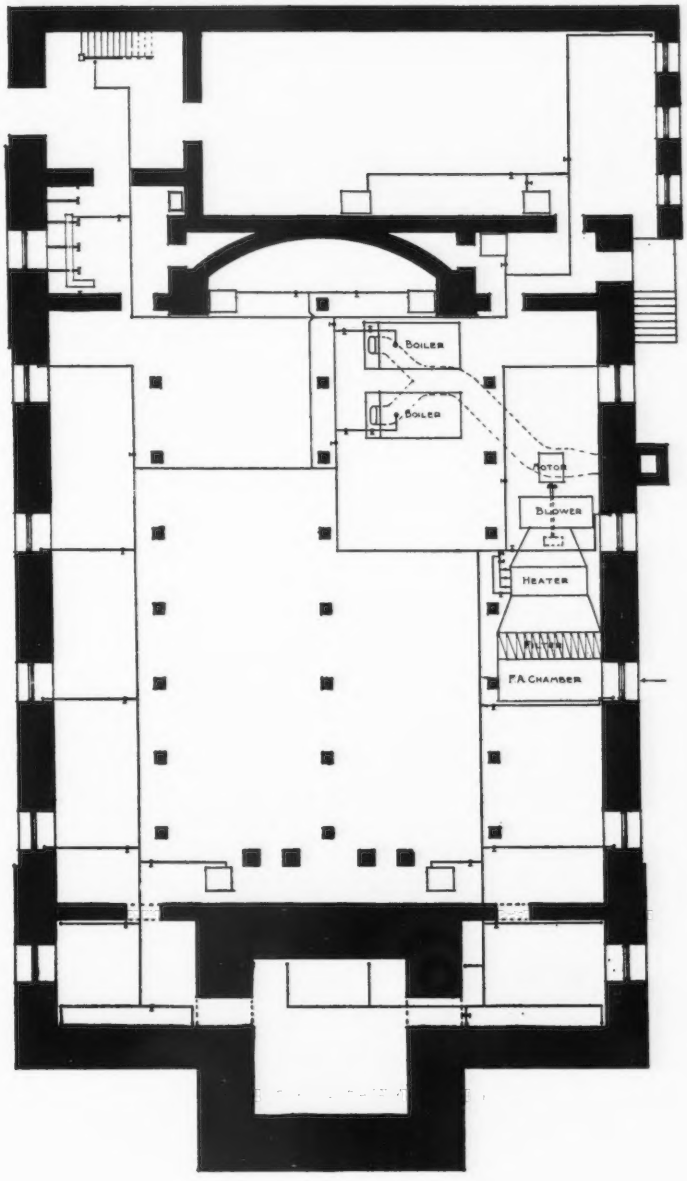
Thirty-one direct radiators are used in the church, containing a total of 2,700 sq. ft. of heating surface.

The seven stacks of Cardinal indirect radiators contain a total of 1,100 sq. ft. of surface. These stacks are suspended from the floor joists on wrought iron hangers.

Air is taken in through an inlet opening on a broad and protected alley



SECTION THROUGH AUDITORIUM, BRICK PRESBYTERIAN CHURCH, SHOWING AIR INLETS AND OUTLETS, ALSO SPACES BEHIND GALLERIES AND LOCATION OF DIRECT RADIATORS BELOW GALLERY WINDOWS.



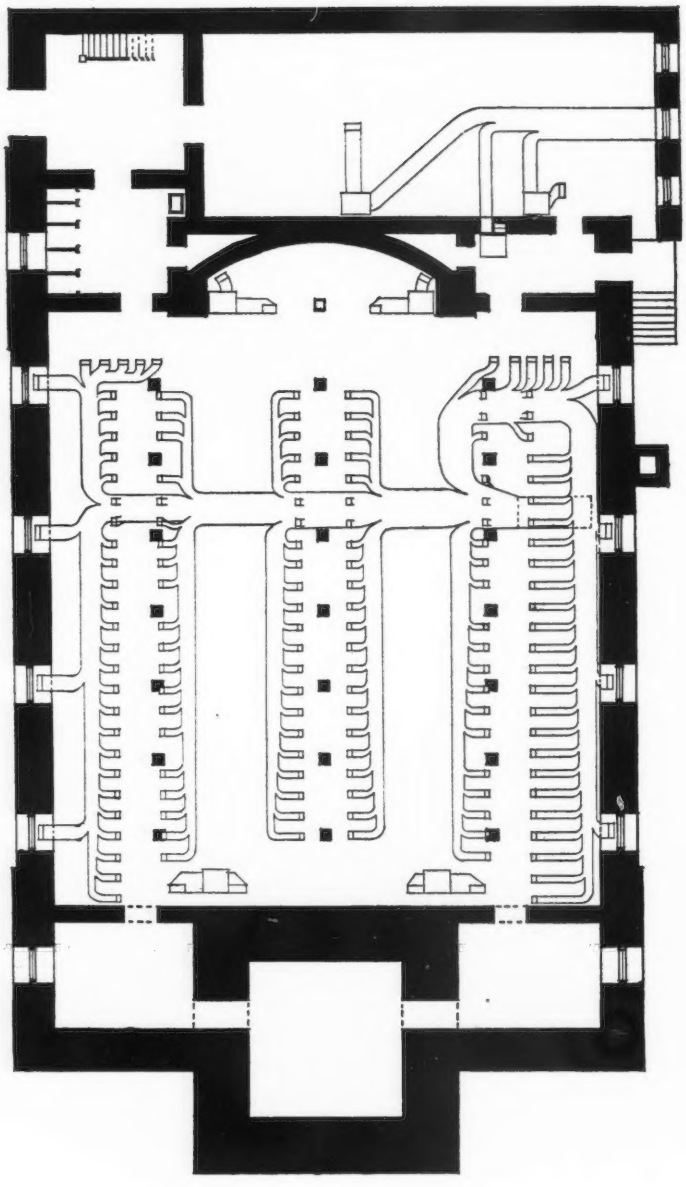
PLAN OF CELLAR

SHOWING BOILERS, PIPING, ETC.

BRICK PRESBYTERIAN CHURCH — N.Y.

SCALE $\frac{1}{8}$"-1'-0"

CADY & GREGORY, ARCH'TS
6W 22ND ST., N.Y.



PLAN OF CELLAR
SHOWING DUCTS

BRICK PRESBYTERIAN CHURCH—N.Y.

SCALE 1/8"-1'-0"

CADY & GREGORY ARCH'TS
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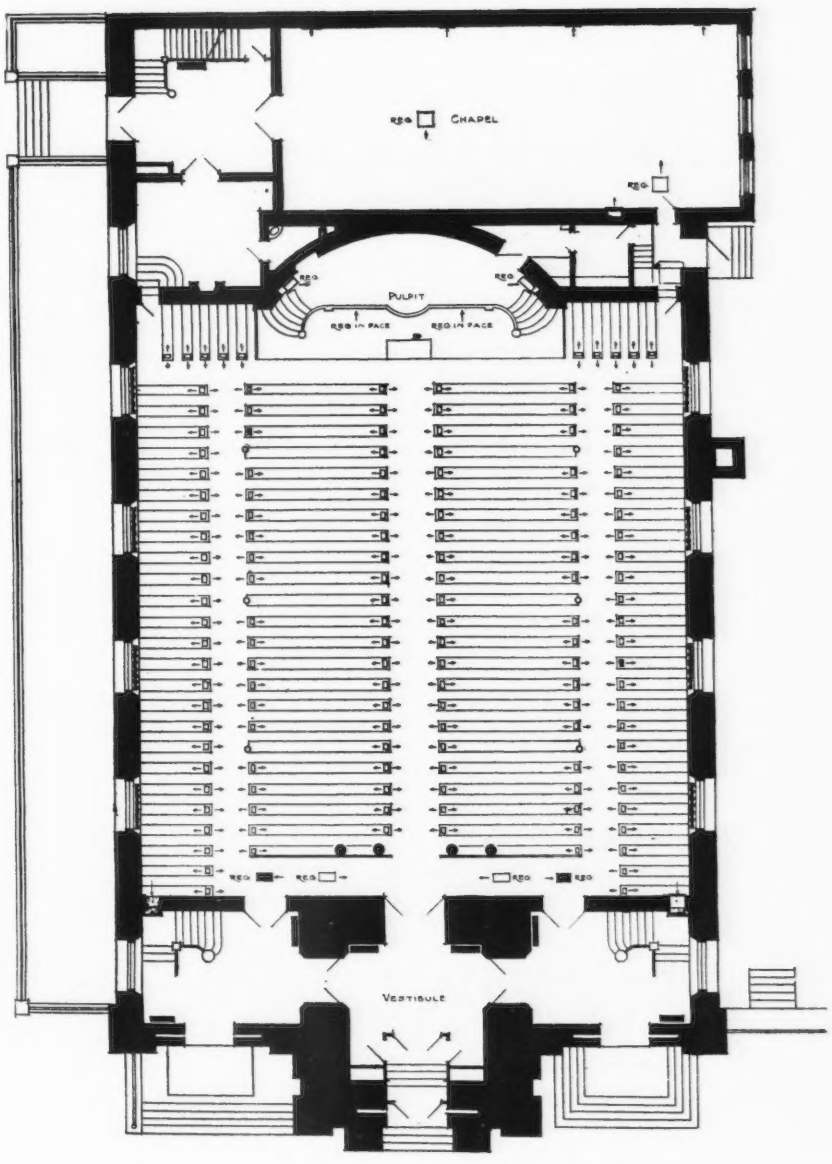


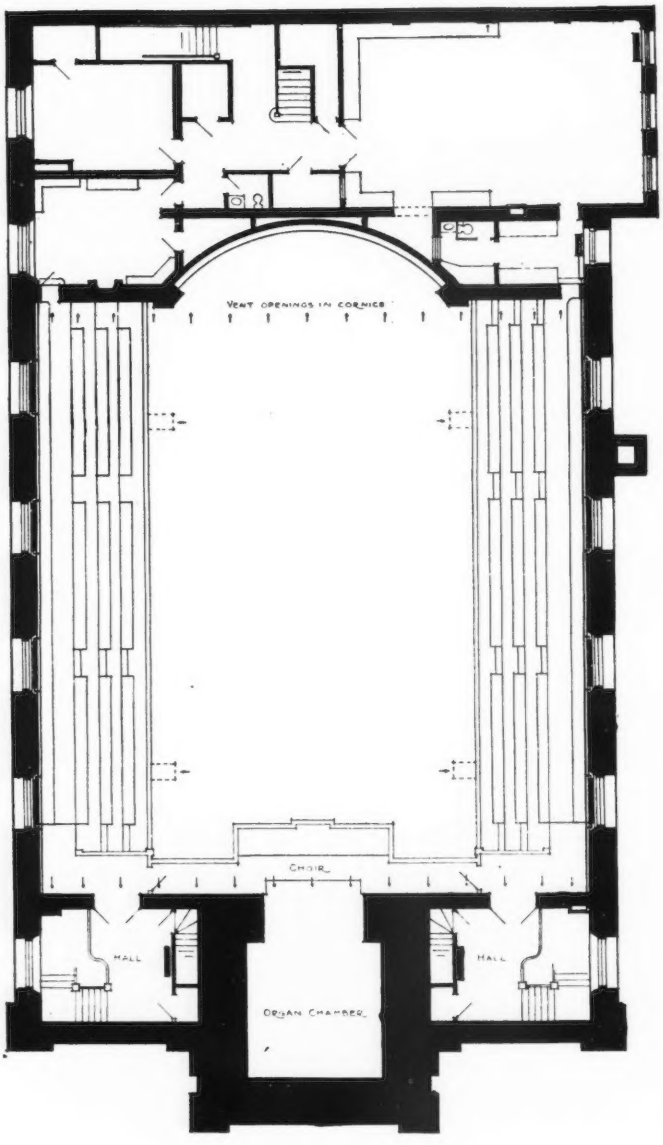
PLAN OF FIRST FLOOR

SHOWING HEATING & VENTILATING

BRICK PRESBYTERIAN CHURCH—N.Y.

SCALE 1/8-1'-0"

CADY & GREGORY - ARCH'TS
6W 22 ST. N.Y.



PLAN OF GALLERY

SHOWING HEATING & VENTILATING

BRICK PRESBYTERIAN CHURCH—N.Y.

SCALE 1/8"=1'-0"

CADY & GREGORY, ARCH'TS
64 W 23 ST, N.Y.

on the north side of the church avoiding the eddies and gusts of the street. It first passes through a galvanized wire screen into a fresh-air chamber. In this chamber are placed cheese cloth filters which are spread over galvanized wire netting attached to wooden frames. The filters have a total area of 750 sq. ft. The air then passes over tempering coils which are made up of five rows of 6¾-in. sections of cast-iron Vento indirect radiators 60 in. long. These have a total heating surface of 1,400 sq. ft. The tempering coils are arranged so that the air can be by-passed around them.

The air is then delivered to the base of the flues by a Sturtevant steel plate centrifugal fan having a blast wheel 7 ft. in diameter and 46 in. wide. The fan is direct-connected to a 9 H. P. slow-speed electric motor wound for 220 volts, with a maximum speed of 160 R. P. M. The motor is provided with a combined starting and controlling rheostat which gives a range of speed from the maximum down to 120 R. P. M.

The main supply duct is connected to the fan outlet by a short length of heavy canvas to prevent vibration.

An adjustable deflector in the connection between each branch duct and the main duct is provided and there are also adjustable dampers in each flue at the pew ends so that the quantity of the air discharged through the registers under the pews may be controlled.

At the first-story windows, the recesses are connected with the fan system of air ducts and there are deflectors in each one to prevent the air from discharging through the bottom grilles of the enclosures. All radiators are painted with yellow ochre and finished with gold bronze.

The work was designed by Cady & Gregory, New York, who are the architects for the alterations, and the work was installed by G. A. Suter & Co., New York.

A Model Heating System Made of Glass Tubing

IODIDE METHOD OF DEMONSTRATING THE FLOW OF WATER THROUGH PIPES

By A. Sayers

A novel method of demonstrating the flow of water through pipes, in which use is made of glass tubes to represent the piping system and a colored fluid to represent the water, has been devised by A. Sayers, lecturer in plumbing at the Municipal Technical Institute, Belfast, Ireland. The apparatus has been used with much success in explaining the many seeming paradoxes in the flow of water in hot water heating systems. The method is described at length in the *Plumber and Decorator* of London. In this description, Mr. Sayers says that many years ago Mr. F. Dye recommended all students of heating to possess themselves of a model in glass of a hot-water apparatus to experiment with and demonstrate principles which might aid them in their studies and help in the solution of difficulties which might arise in their daily calling.

Apparatus of various kinds have also been introduced in the different technical schools to demonstrate the flow of water through pipes and aid in imparting instruction. Thermometers inserted at different points indicate the rise and fall of temperature, and a series of observations made during the experiments enable the students to make certain deductions regarding what is happening inside the system, and in this way a great deal of information may be obtained. But here, again, the absence of ocular demonstration is a serious drawback, and often much has to be taken for granted.

When working with glass apparatus some indicator must needs be employed in order to demonstrate any movement which takes place in the water. Sometimes suspended particles, such as amber filings, and sometimes a colored solution, such as permanga-

nate of potassium, are employed; but none of these can be considered wholly satisfactory.

The introduction of a coloring solution that will change its color with the rise and fall of temperature has opened up possibilities that must have far-reaching results, and converts the glass model heating apparatus into a working model of a hot-water circulating plant. By the changing of color as the temperature rises and falls, one is able to follow the various directions of the currents, both during the period of circulation and also draw off, as well as to observe the degree of stagnation that may be in any part of the water column, arteries, or branches.

For some time past, in the Building Trades Department of the Municipal Technical Institute, Belfast, glass apparatus has been extensively used to show the various currents in hot-water circulation, a solution of iodide of starch, or what has come to be locally known as the "Still-Davidson" method, being employed as an indicator.

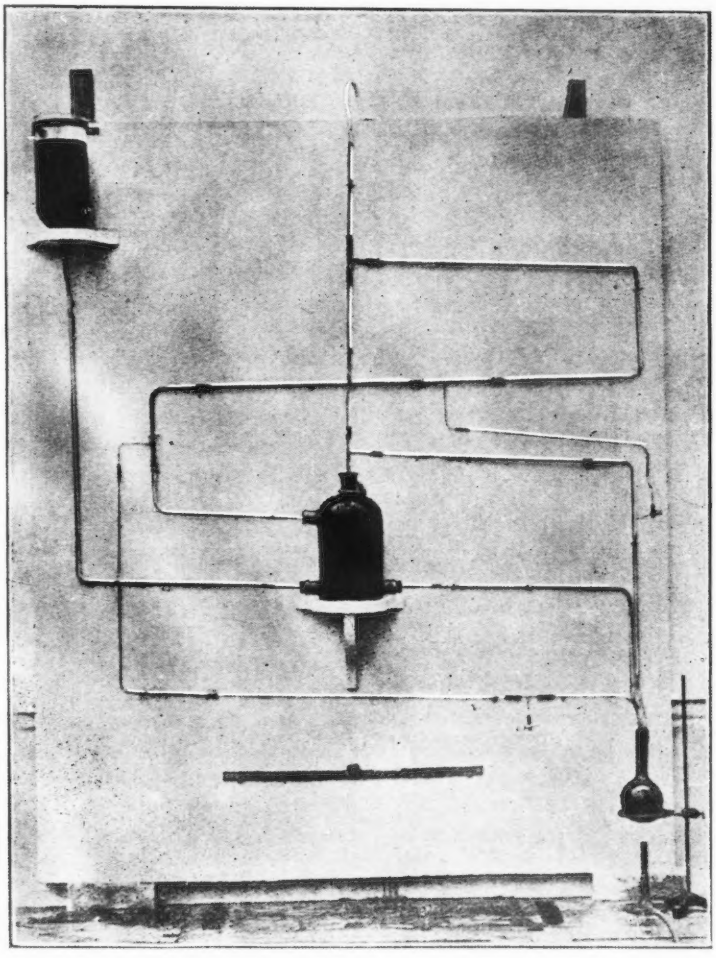


FIG. 1.—APPEARANCE OF APPARATUS BEFORE HEAT WAS APPLIED—ALL PIPES AND FITTINGS OF THE SAME DARK COLOR

Outside chemistry it may not be generally known that if iodine be added to a solution of starch a deep blue color is produced. This color is destroyed if the temperature is raised to between 160° and 180° F., at which temperature the liquid becomes colorless. On cooling, the solution again returns to its original blue; in other

words, the blue color disappears when sufficient heat is applied, but reappears on cooling.

If a quantity of iodide of starch be added to the water in a glass hot-water apparatus a blue tint is imparted to the water. When heat is applied colorless. When the tap is shut off, and the water allowed to be stagnant in the branch-pipe, the blue color returns on cooling, demonstrating the need for secondary circulation.

Again, it is most instructive to watch the behavior of the return cold

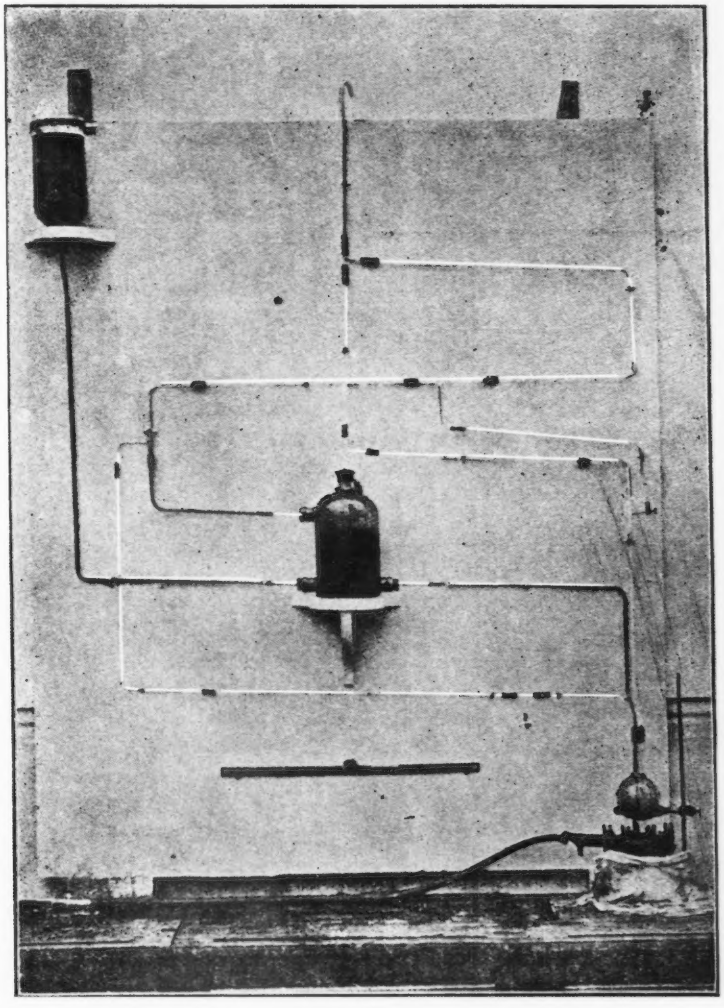


FIG. 2.—APPEARANCE OF APPARATUS SOME TIME AFTER HEAT WAS APPLIED—FLOW PIPES CLEAR. RETURN PIPES, COLD SUPPLY AND BRANCH PIPES DARK

to the boiler and the temperature of the water raised, the water becomes colorless, and may be watched in its progress along the flow-pipe into the cylinder and through the various other arteries connected with the system. If water be drawn off from a long branch pipe the first water drawn off will be blue, and afterwards commence to flow blue water as it enters a hot column in the boiler or cylinder; how it falls or gravitates to the bottom of the vessel—not mixing with the hot (colorless) lighter water, but finding its proper level according to the law of gravitation. The same principle is again exemplified when hot water from a flow-pipe enters a cold column;

it ascends direct to the top in obedience to the same law.

The fact that it is possible to demonstrate by this means clear (hot) currents of water passing through dark (cold) columns, or dark (cold) currents passing through clear (hot) columns, not alone adds to the interest, but it simplifies very considerably a most intricate subject, and places an intimate knowledge of scientific principles within the reach of all.

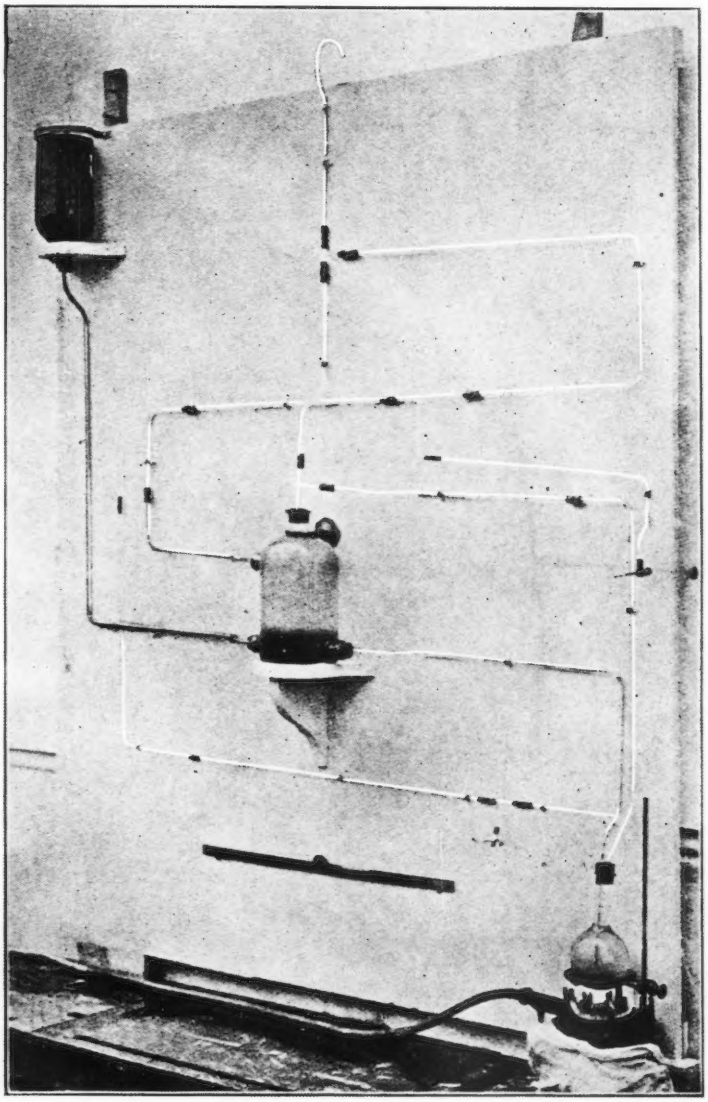


FIG. 3.—APPEARANCE OF APPARATUS WHEN ALL THE WATER HAD CIRCULATED ONCE ROUND THE SYSTEM. ALL PIPES AND CYLINDER CLEAR, EXCEPT LAYER AT BOTTOM OF CYLINDER

If the reader will refer to Fig. 1, he will see a cylinder and secondary return system. It will be noticed that a small pipe is taken from the secondary circulating-pipe and enters the boiler in the same way as the primary return-pipe; and although the illustration shows the secondary return-pipe entering the side of the cylinder near the top, this pipe, being shut off, was not acting during the experiment, the secondary circulation being by way of the small pipe into the boiler. Hence, we have before us a second-

ary circulating system, with the secondary return-pipe reduced in diameter and connected with the boiler.

The 2-foot rule below the cylinder gives the scale, and enables the reader to form an idea of the dimensions of the apparatus, which consists of glass bottles and flask connected by glass tubes and rubber connectors.

It is not, however, the province of this article to discuss this or any other particular system, but rather to deal with the iodide method of demonstrating the flow of water through pipes.

The apparatus was filled with water, to which had been added a solution of iodide of starch, made up as follows:

6 grams of starch.
0.64 grams of iodine.
5 grams of potassium iodide.
3 litres of water.

Make the starch into a thin paste with water, and add 500 cubic centimeters of boiling water. Continue boiling until all the starch has been dissolved, and cool by adding cold water.

Dissolve 5 grams of potassium iodine in 30 cubic centimeters of water, and dissolve the 0.64 grams of iodine in it. This quantity will be sufficient to color from 12 to 20 litres, depending on the intensity of color required.

Fig. 1 shows the apparatus before heat was applied, and it will be seen that all the pipes and fittings are the same color—dark.

Fig. 2, which was taken some time after heat was applied, shows the flow-pipes clear, and the return-pipes, cold supply, and branch pipes dark. On closely examining the cylinder it will be seen that the upper hot portion is clear, while the lower portion is dark; thus showing the contrast between the hot and the cold water and the absence of any mixing in this fitting.

Fig. 3, taken when all the water had circulated once round the system, shows all the pipes and cylinder clear, except the layer at the bottom of the cylinder.

The dark, cold water, seen in Figs. 2 and 3 entering the boiler, is worthy of notice, as is also the stagnant dark water in the secondary return-pipe between the cylinder and the point where the reduced pipe joins. It will be seen that the water in the expansion-pipe above the secondary flow-pipe is also stagnant (dark).

The return-pipe terminates in the boiler about half-way down, but it will be noticed in Fig. 2 that the cold, dark return water continued in a direct current until the bottom of the boiler was reached, and then spread out in a sheet. On drawing off, the direction of the currents could be seen, and the various stages of mixing noted with interest.

The points mentioned are only a few of the many that might profitably be dwelt upon, but the present article is intended simply to place before the reader a few facts that may be of interest and help other centres, as well as individual readers, to provide themselves with suitable apparatus and adopt similar methods of studying the intricacies of hot-water circulation.

It can be readily understood how very difficult it is to convey by photography the circulation of water through pipes, and it must be confessed that the accompanying illustrations do not do justice to the apparatus.

This method of demonstrating currents not only applies during the heating processes, but is still more instructive during the periods of draw-off. For example, if it is desired to show the methods of connecting the cold supply to the cylinder, let the apparatus be fitted up with the cold entering the cylinder pointing in an upward direction; and when the cylinder is heated and clear, draw off some water from a branch and note the effect. Afterwards connect the cold to the cylinder, pointing in a downward direction: repeat the experiment and note the different effect. In this way, many points at present only dimly understood may be clearly demonstrated and places beyond the sphere of doubt.

In conclusion the writer would point out that in working with model apparatus, care must be taken to guard against erroneous results and allowance must be made for the miniature fittings, remembering that heat, friction, capillarity, etc., are factors to be considered.

Heat, Light and Power in Buildings

WHAT IT COSTS TO OPERATE THE ISOLATED PLANT

By C. M. Ripley

An interesting display of figures showing the operating costs by the year of isolated plants in various types of buildings was presented by Mr. C. M. Ripley at the recent convention of the National Building Managers' Association in Washington. Mr. Ripley's figures covered plants installed in office buildings, loft buildings, apartment houses and hotels and were designed to show the economy of the isolated plant manufacturing its own electricity as compared with that in which electricity is supplied from a central station. The principal portions of Mr. Ripley's paper are presented herewith:

A discussion of unit costs of heat, light or power is likely to be misleading unless further evidence is provided regarding total yearly cost. These three items of expense are interwined and co-related (or can be) in buildings containing a private electric plant. The total yearly cost, then, of operating heat, light and power equipments, is the final test.

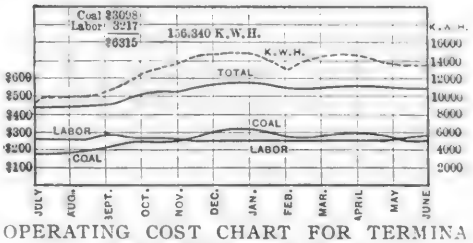
So for seventeen buildings in New York I will give you the total yearly operating cost for these four different items, heat, light, power and engineer's services for repairs, etc.

The term "Cost of Electric Plant" refers to the extra engineering investment which the building owner made in excess of the cost of a heating plant only. Depreciation is figured at 5% and interest at 5% on the original investment.

THE TERMINAL OFFICE BUILDING

The Terminal Building, at 103 Park avenue, corner of 41st street, New York City, is twelve stories in height on a corner plot 100 ft. x 100 ft. and contains an electric plant which cost $12,000 to install. Since my paper in Detroit on this building it has become entirely rented—all stores filled—even the building manager being forced to take quarters in the basement. The result of this was that a fourth electric elevator was added to the electric output, even with Tungsten lamps throughout, has increased to an annual total of 156,340 kilowatt hours. The building used to be on Edison service.

A comparison of the electric output and the coal bill for the past nine months, compared with the nine months' period described in my Detroit paper, is very interesting, as it shows what effect the filling of the building had on the operating cost. Between October, 1909, and June, 1910, inclusive, 125,430 kilowatt hours were produced, with a total fuel bill of $2,528. For the preceding term described at Detroit, October, 1908, to June, 1909, inclusive, the electric output was only 91,770 kilowatt hours and the coal bill $2,145. Now the interesting part of this is that the increased output of 33,660 kilowatt hours only cost $383 in coal, since the fixed charges were not increased any by the increased electric output. I do not like to talk about cost per kilowatt hour—I prefer to talk about yearly costs of heat, light and power. But last year when I stated that all kilowatt hours above a certain amount (140,000 per annum) were valued at 2 cents each, the fact was disputed. Now please note that I justify my position of last year, as the additional 33,660 kilowatt hours cost at the rate of 1.13 cents per kilowatt hour, while if bought from the Edison company it would have cost 5 cents each. Again,



OPERATING COST CHART FOR TERMINA BUILDING, NEW YORK

a point was made last year that my figures were not satisfactory because the building was only three-quarters rented. Now that the building is full it has turned out an excess amount of electricity worth from the Edison company $1,683, at an annual expense of but $383 in coal.

To summarize this operating record for the plant twelve months we have the following total costs for making light, heat and power:

ACTUAL COST OF HEAT, LIGHT AND POWER

Coal	$3,008
Wages	3,217
Water for boiler	100
Repairs, oil, ash removal and miscellaneous (not including lamps)	851
Total	$7,266
Less sale of electricity	400
Net total cost on building manager's books	$6,866
Add 10 per cent. plant cost	1,200
Net total cost on treasurer's books	$8,066

This is the entire cost of heat, electricity to the amount of 156,340 kilowatt hours, repairs and miscellaneous —even fixed charges and depreciation.

Now, should the electricity be brought from the street, and the heat produced on the premises and men employed for repairs, etc., the cost would have been as follows:

ESTIMATED COST, IF ELECTRICITY HAD BEEN PURCHASED

Coal	$2,000
Fireman, eight months	400
Engineer and building manager	1,500
Electricity, 156,340 kilowatt hours times 5c.	7,817
Care of elevators, heat and plumbing and wiring repairs (estimated)	300
Oil and grease	50
Total estimated cost buying electricity	$12,067
Less sale of electricity	400
Net total cost, if buying electricity	$11,667

Now, the actual cost, including fixed charges, which appears on the treasurer's book, was only $8,066, thus showing a saving attributable to the electric plant of $3,601. This means that the plant will pay for itself in about three years. It means that a capital of $12,000 is invested and earns $3,600 a year, or 30% per annum—and this after paying 5% interest on itself. Again, $3,600 represents the annual interest at 5% on an investment of $72,000 and yet the electric plant only cost $12,000, and though disputed last year the record of the plant improves as the building fills up and the output of electricity increases. The point cannot be emphasized too strongly that when we add to the operating expense 5% for interest and another 5% for depreciation we charged it to the plant; therefore, the plant saves enough to pay for borrowing the money, then saves enough to pay for itself all over again in twenty years, and then saves above all this $3,600 per annum, which will pay for itself in about three years.

The plant consists of a very simple arrangement of three 75 kilowatt units and two 175 H. P. horizontal fibre tube boilers. The total engineering costs of the building were as follows:

Complete wiring of building	$6,500
Complete steamfitting and boilers	9,000
3 Harrisburg engines	4,750
3 75-kilowatt dynamos	4,000

THE MONOLITH OFFICE BUILDING

The Monolith building, 43-45 West 34th street, 200 ft. deep, 50 ft. on 34th street and 30 ft. on 35th street, thus extending the whole block. The curve I have prepared is highly instructive, as it shows graphically the detailed operating cost on the building manager's book for the past twenty months.

Three different kinds of operation are shown during this period, as follows: From December, 1908, to October, 1909, the building was on Edison service exclusively. From October, 1909, to January, 1910, they were starting up the new electric plant, using some Edison and some of their own electricity. During the remainder of the time they were using their own electricity exclusively. The total net cost is the heavy black line at the top and is obtained by adding all operating expenses for the entire 20 months and subtracting therefrom the entire income from the sale of electricity to tenants and neighbors. It

is this difference month by month that locates the points on this curve.

Also on August 1 of this year they started to supply the New Netherland Bank with electricity which it is expected will bring in about $1,400 per year increased income, making total cash income from tenants and neighbors about $3,600 per year.

The curves show the variations in the different items of expense month by month and that a net saving on the Building Manager's books of between $450 and $600 per month has

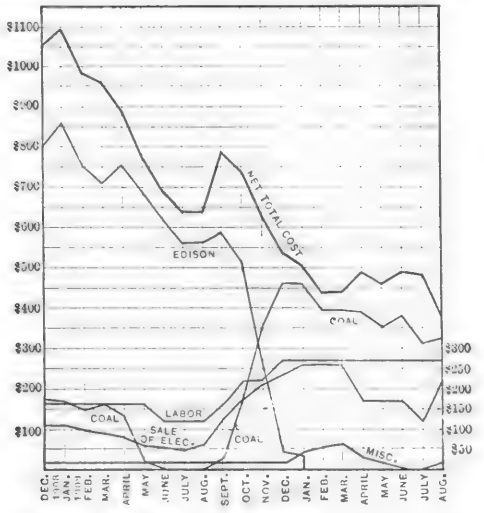


CHART SHOWING OPERATING COSTS OF MECHANICAL PLANT IN MONOLITH BUILDING, NEW YORK

Upper black line shows How Installation of An Electric Plant Affected Operating Cost (Net)

been effected. A most interesting fact is that the saving is paying for the electric plant. Actually the payments on the plant were arranged by us to be spread over a period of three years and no extra investment was required at all. An important item, and one likely to be overlooked, is that with the electric plant installed the income of $3,600 is contrasted with the meagre income from tenants of $879, which was received in the year from December, 1908, to December, 1909, with Edison service. Also you cannot supply your neighbors when using street service. The itemized costs of the main part of the electric plant are as follows:

3 Ridgway engines and dynamos	$5,500
Switchboard	927
Storage battery	3,000
Electric meters	352
Main items	$9,779

It is unfortunate that the plant has not been running for a year. But the year's cost on Edison service for the year April, 1908, to March, 1909, was as follows:

Coal	$1,047
Engineer	1,300
Fireman	350
Ash removal	120
Lamps	200
Edison service	7,005
Repairs	100
Supplies	100
Total	$11,131
Sale of electricity	879
Net total cost on building manager's books	$10,252

It is highly probable that next winter they will stop burning $3.35 coal and change to $2.25 fuel. Tungsten lamps are used throughout. These figures on the Monolith were furnished through the kindness of Mr. Vivian Green, one of the owners of the building. While the power plant was designed by us, it is not operated by us.

(Mr. Ripley presented figures for a number of other buildings showing similar results of operation.)

LANGSDORF LOFT BUILDING

The Langsdorf Building, corner Spring and Crosby streets, is twelve stories in height on a corner plot 100 ft. x 100 ft. The building originally had Edison service. A plant was designed, consisting of two units, only one of which was installed at first to demonstrate facts, which follow: The original installation with means for the additional unit cost about $8,300. It consisted of a Fishkill Corliss engine, belted to a C. & C. dynamo of 125 K. W. Wing blowers were installed to facilitate the burning of refuse and sawdust from the wood working plant. For the year July, 909, to June, 1910, the costs were as follows:

ACTUAL COST FOR HEAT, LIGHT AND POWER FOR ONE YEAR

Coal	$3,178
Labor	2,929
Ash removal, repairs and miscellaneous	950
Water (from deep wells)	000
Total manufacturing cost on building manager's books	7,057
Less sale of electricity	2,835
Net manufacturing cost on building manager's books	$4,202
10 per cent. of cost added by treasurer	830
Total net cost on treasurer's books	$5,032

The above is the cost of making 180,910 K. W. H., heating the building, furnished his steam, repairing elevators, repairing the plant, cost of oil and miscellaneous, but not including lamps.

Estimate cost if electricity had been purchased:

Coal for heat and hot water and live steam	$1,550
Chief engineer and superintendent	1,200
Fire, 12 months at $55	660
Edison electricity 180,810x5c.	9,045
Care of elevators, repairs, oil and grease	350
Total	$12,805
Less sale of electricity	2,835
Net total cost if buying electricity	$9,970
Actual total cost when making electricity	5,032
Difference in favor of making electricity	$4,938

Here we have an $8,300 investment saving $4,900 per year, after it has saved money enough to pay interest on itself, and money enough to pay 5% depreciation, $4,900 per year is almost 60% per annum on the investment of $8,300.

Authorization was given us late this summer to complete the plant with the addition of a 150 H. P. Brownell engine and an 80 K. W. C. & C. dynamo. These are to be kept in reserve for possible emergency, and cost approximately $2,800. This building is a typical New York City loft building, and contains a complete printing establishment, making a specialty of night work and delivering on the judge's desk at 9:30 A. M. the complete testimony and court proceedings of the day before. It also contains wood-working machines, buffing machines, hot tables and glue pots, requiring live steam, etc.

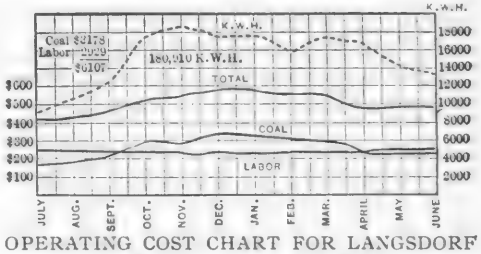
TEXTILE LOFT BUILDING

Perfectly comparable with the Langsdorf is a textile building not far from it, which is also 12 stories high, and also on a corner plot 100 ft. x 100 ft. The superintendent of the building in 1905 reported the following operating cost at that time:

Electricity (in 1905)	$10,056
Coal	1,320
Wages	1,768
Miscellaneous (not including lamps)	400
Total expense on building manager's books	$13,544

Income from tenants, nothing.

I am informed that within the past few years the total cost of electricity has been reduced to $9,140, of which about $2,000 is paid for by the tenants at no profit to the landlord. This change in the policy of renting has helped the landlord some, but the total yearly cost is still almost the same.



OPERATING COST CHART FOR LANGSDORF LOFT BUILDING, NEW YORK

In the year 1901 we made a proposition to install an electric plant in this building. The owner preferred not to make any changes, and as a result has paid in unnecessary operating expenses the sum of over $45,000; or nine times the gross difference between his annual operating expenses and the gross operating costs of the Langsdorf building, which difference is over $5,000 per annum. Even assuming that the Langsdorf tenants got their electricity free. This $45,000 and the interest on a portion of it for the last 9 years, 8 years, 7 years, etc.,

would have been saved if engines and dynamos costing less than $10,000 had been installed in 1901. Please note that the total amount of electricity used in each of these buildings is almost identical as are their sizes.

NINE-STORY LOFT BUILDING

A nine-story building at 213 Grand street, New York. This building has 4,244 sq. ft. rentable area per floor, and is on a plot equivalent to 50 ft. x 92 ft. irregular. The building has two elevators, a small electric plant. The entire heating and wiring system of the building was designed in our office and cost as follows:

Electric wiring for entire building.	$850
1 Ridgway engine	$850
1 Sprague dynamo, 75 kw	1,182
125 h.p. Titusville boiler	875
Complete steamfitting, including pumps, radiators, etc.	4,950
Meters and later installations	213
	$9,505

Of this amount the electric plant cost about $5,000.

This plant started operating last February and up to September 1, a period of just seven months, in 1910, during part of which time the building was only partly rented, the costs were as follows:

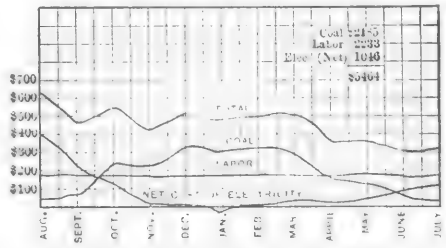
Screenings, at $2.06	$506
Labor (the engine room force operates 1 elevator)	870
Edison electricity	150
Repairs, ash removal and miscellaneous water, etc.	459
Total cost on building manager's books	$2,075
10 per cent. of plant cost added by treasurer	500
Total cost on treasurer's books.	$2,575

But during this time the receipts from tenants had been $2,803. This includes two tenants who purchase live steam the year around for manufacturing at $160 per year. Thus, the operating cost, net, for the first seven months has not only been less than nothing for furnishing heat, hot water, public lights and electric power for pumping and for two elevators, but has actually shown a profit of several hundred dollars earned by the engineering department. And do not forget that this profit is in excess of 5% interest and 5% more for depreciation. As the electric output increases, this will become even more favorable.

HENDRICK HUDSON APARTMENT HOUSE

The Hendrick Hudson Apartment House, at Riverside Drive and 110th street, is 200 ft. x 100 ft., 9 stories high, containing 70 apartments. The 200 ft. length faces the Hudson River, and besides the cold wind from the river, the building is exposed on the corner of 110th street as well as at the corner of 111th street. The boilers are used for heating and in the coldest days for pumping also. All the electricity is furnished by the New York Edison Co.

We have found that central station



OPERATING COST CHART FOR HENDRICK HUDSON APARTMENTS, NEW YORK

electric service is more profitable in a medium size apartment house (without a refrigerating plant) than in any other type of building in New York except the theatre. This is because the cost of operating the plant to provide a 24-hour service is high and yet the electric consumption is much smaller than in an office building of the same size with a 12-hour service. Also the electric consumption is much less than in a hotel of the same size, as is also the elevator travel. In an apartment house the income from the tenants is almost nothing during the summer months where the tenants go away for the summer.

For the year, August, 1909, to July, 1910, the operating costs were:

Coal	$2,185
Wages	2,233
Edison electricity	5,105
Miscellaneous, including lamps	1,149
Total operating expense	$10,672
Less sale of electricity	4,059
Total net operating expenses.	$6,613

The total consumption of electricity was 102,105 K. W. H., including the use by the tenants. It is necessary to use 100,000 K. W. H. per annum in order to obtain the 5% rate in New York, and the custom is to sell to the tenants at 10% per K. W. H. In winter the pumping is done largely by steam, the pressure being kept at about 60 lbs. per square inch. The exhaust is used to help heat the building and for hot water for about 150 bathrooms. The fuel costs $1.98 per ton net and in addition the garbage and refuse is burned under the boilers.

In an apartment house the income from the tenants is almost nothing during the summer months where the tenants go away for the summer. For the year August, 1909, to July, 1910, the operating costs were:

Screenings, at $1.98	$2,185
Wages	2,233
Edison Company electricity	5,105
Miscellaneous, including lamps	1,149
Total operating expense	$10,672
Less sale of electricity	4,509
Total net operating expense	$6,613

HOTEL HARGRAVE

The Hotel Hargrave, 50 ft. x 200 ft., 12 stories and basement, located on 72nd street, has 300 guest rooms, 200 baths, a restaurant, four electric elevators and complete ice and electric plants, but no laundry. Of course, being a hotel, they have 24 hours' service. The electric plant, including a storage battery, cost $12,063. The operating costs for the past year were stated by the owners to be $200 per month less than that of any other hotel he knows of similar size. They are as follows:

Coal	$6,237
Wages	4,895
Boiler water (estimated)	150
Ash removal	120
Repairs, oil, lamps and miscellaneous	1,400
Total manufacturing cost on building manager's books	$12,802
10 per cent. of plant cost added by treasurer	1,306
Total operating cost on treasurer's books	$14,108
Sale of electricity, nothing	000
Actual total net operating cost on treasurer's books	$14,108

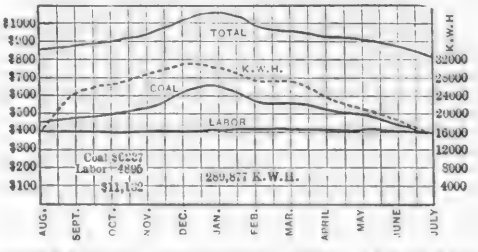
Above is the cost of producing 289,877 K. W. H of electricity, ice refrigeration, heat for a building a block long, and 12 stories high and hot water for cooking and 200 bath rooms.

Estimated cost of running this hotel, in case electricity were bought, would be as follows:

Edison electricity 289,877 kw. hrs. × (5 − 4½c.)	$13,944
Coal for heat, ice and hot water	4,500
Wages	3,480
Repairs, ash removal, oil, water, etc.	600
Total operating cost	$22,524
Sale of electricity, nothing	000
Total net operating cost if buying electricity	$22,524
Actual net total cost on treasurer's books when making electricity	14,108
Saving by making electricity	$8,416

Thus the plant paid for itself in less than two years or, looking at it in another way, pays 65% per annum on the investment.

It happens that when this hotel was half its present size it did not have any electric plant; thus our office is in possession of records of operating ex-



OPERATING COST CHART FOR HARGRAVE HOTEL, NEW YORK

penses of the ice and heating plant before it was supplemented by the electric plant. It is from these records that I estimate the value of the ice, heating and hot water service given above. The fuel burned here for the last three years has cost $2.22 per net ton. Please note that the total operating expense of $14,108 for ice, heat, light, power, repairs and fixed charges, is only $164 more than the cost of the electricity alone would have been if purchased from the Edison Co. The hotel is the most profitable place for an electric plant that I know of,

unless it be a factory needing heat for drying or for other manufacturing purposes.

Besides selling electricity to the tenants, an apartment house on Broadway with an electric plant is getting $1,800 per year by selling exhaust steam to a neighboring building. Another apartment house on Park avenue is heating every house on the block and deriving a good profit. A hotel on West 47th street is supplying its next-door neighbor with electricity and steam. A packing establishment on West street is selling electricity, heat, ice and refrigeration to every building on the block. An office building in Binghamton, N. Y., is selling electricity, heat and hot water to a nearby office building and to the Carnegie library, even across the street, and while there was quite a fight about it, the arrangement was finally approved by the courts, where the matter was taken by the local electric company.

ELECTRIC PUMPS VS. STEAM PUMPS FOR HYDRAULIC ELEVATORS

The following data from the Security Interest Life Insurance Co.'s building in Binghamton may shed some light. A series of four different tests were run. One week they would use the electric elevator pump and the next week the steam elevator pump. The coal consumption, electric output and number of elevator trips were carefully noted. The following table gives in brief the result of a typical test run for two five-day periods:

	Electric Pumps May 3-7.	Steam Pumps May 10-14.
Coal burned	17 3-10	20 tons
Number of elevator trips	3,937	3,363
Kwh. of electricity ..	4,780	3,230

The conclusion is that 18% more service was delivered with 16% less fuel when electric pumps were used or about 40% in their favor. Please note that the electric pumps saved $8.05 in the five-days' test. But if the additional 1,550 K. W. H. to run these pumps had been bought from the electric company at 5 cents, it would have cost $77.50. Or if bought as low as 3 cents per K. W. H., the electricity would have cost $43.50—entirely wiping out the saving of $8.00 in the fuel bill which the electric pumping effected.

THE WIDE VARIATIONS IN COST

Let me review briefly some of the contrasts in cost of light, heat and power that I have presented:

Terminal Office Building (making its electricity) is costing this summer just half for fuel what Monolith Building (also making its electricity) is paying. Both buildings same size, character and location. Terminal Office pays $2.22 per ton and the Monolith Building pays $3.35 per ton. Both popular busy buildings.

The Monolith Building (counting fixed charges) is costing $300 to $500 less every month (making its electricity) than it did last year before installing the electric plant and when it was buying its electricity.

The Langsdorf Loft Building (making its electricity) is costing $5,500 less per annum than No. 9, which buys its electricity. Both buildings exactly alike.

Discussion

MR. R. P. BOLTON: The first question in connection with a power plant installation in a building is not only a question of economy but it is whether we want to go into that class of business at all. Do we want to make soap because we use soap, and on the same principle, are we obliged to make electricity because we use it? The tenant pays us rent; why, then, as the tenant is paying us rent and as he uses soap, why not go into the manufacture of soap or else, in any building, make it so the tenant pays an adequate price. The mere fact that you can go out and manufacture soap does not necessarily lead you to the conclusion that you must manufacture your own soap. Is it not better to put this work into other hands and divest yourself of the responsibility and anxiety in connection with these things?

Another point that is lost sight of in the installation of power plant is that the space which is occupied by

this plant you could rent out and get good money out of it, because the plant does not pay interest on itself. Those figures are remarkable, but the gain that Mr. Ripley has hown to you, or the comparative gains, are paper gains.

The use of electricity, moreover, has been the curse of the real estate men. There was a time in the real estate field when the real estate man did not have to bother with electricity at all. He put gas in for the tenant's use, but to-day he has the anxiety of supplying current to a number of buildings with tenants that don't care how much they use, and so the real estate man has got into a business which he has no right to be tied up with, that of manufacturing electricity, and it is nonsense to do that when you can get rid of it.

Now, Mr. Ripley has given you some instances showing a great economy in operating certain buildings as compared with the operation of buildings by the outside service, but he has not informed you how the conditions are obtained around those two buildings, the comparative conditions.

Let me take, for instance, a building which Mr. Ripley was apparently quite proud of, and I think from his point of view it was all right, but he described a certain loft building that was run with three steam boilers and where they put a power plant in, and I want to say to you, gentlemen, that those boilers have been used, under my observation, and that the plant has been run on the ragged edge of destruction. Now it should be perfectly apparent to those of you who have followed the figures that those tenants were paying for the operation of that plant, that the owner has shifted the responsibility, the financial responsibility, onto those tenants, but he has not shifted the responsibility of maintaining the service, and any one of them is liable to sue him if he falls down on the contract, and that is one of the things that those owners want to take into consideration. Those buildings have had for a long time a waiting list of probable tenants, and if they were desirable at all that building could be rented for more than it is rented for now, and, therefore, if the owner would turn right around and

(*Continued on page 27*)

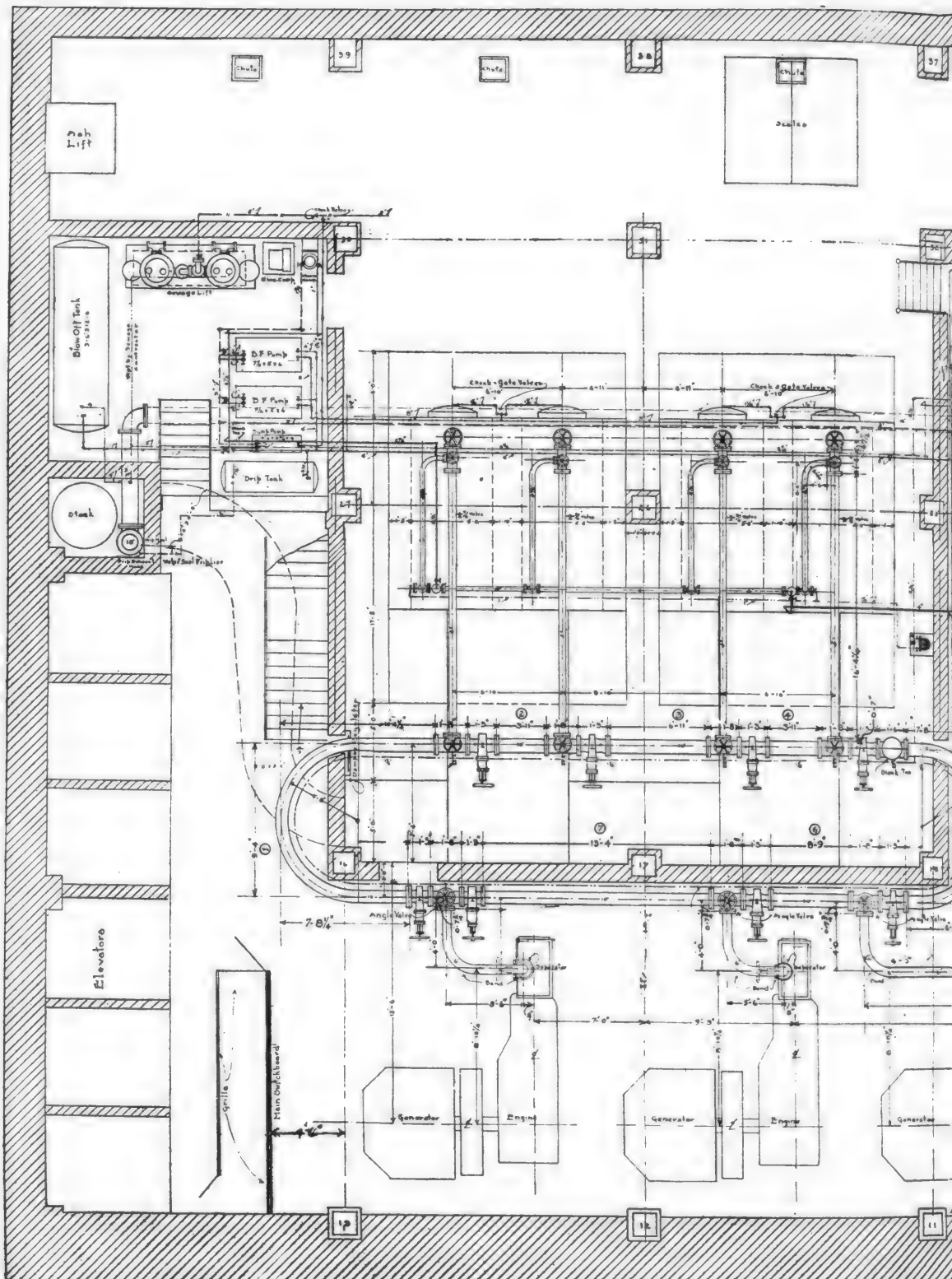
Mechanical Equipment of a New Office Building

THE MORRIS BUILDING, PHILADELPHIA, PA.

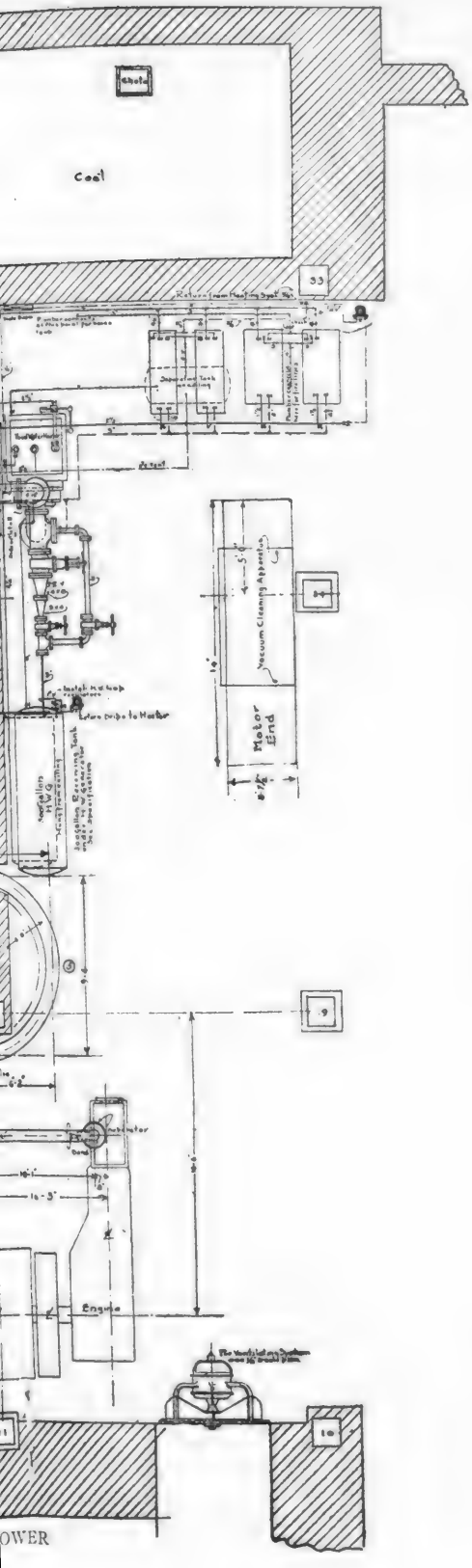
A plant illustrating in its mechanical equipment many of the latest features of present-day practice is shown in the accompanying drawings. It was installed in the Morris Building, Philadelphia, an 18-story structure with basement and sub-basement. The apparatus includes boilers, steam engines, electric generators, vacuum sweeping system and sewage lift system. The building is heated by steam operating on the Warren Webster system.

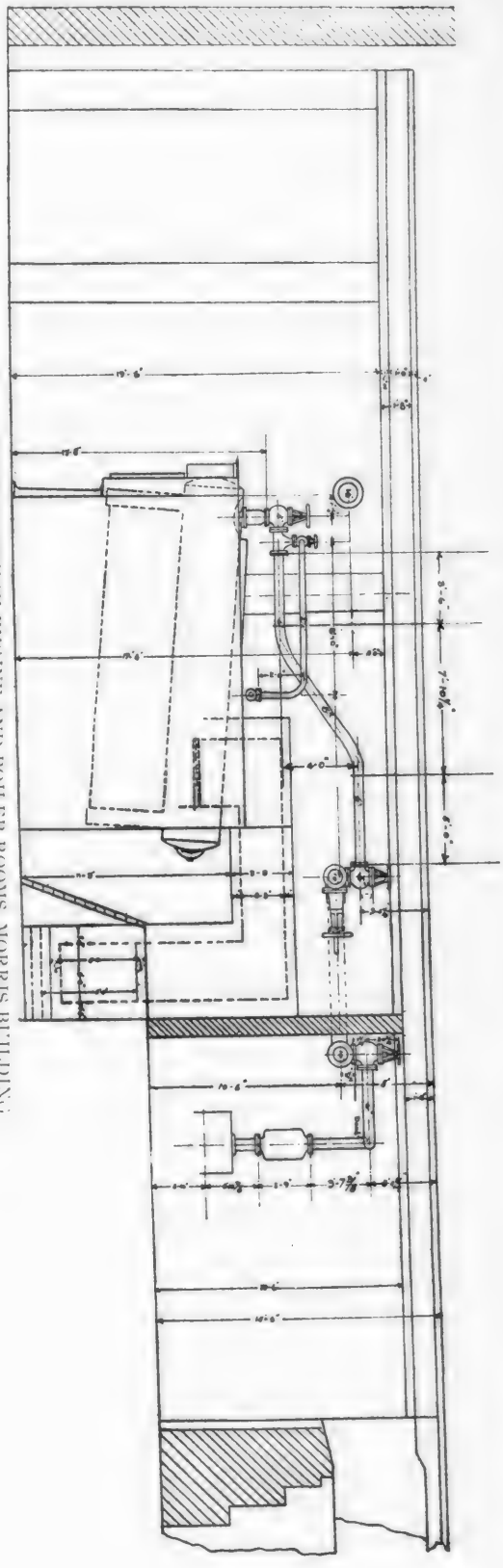
The principal feature of the installation may be seen from the drawings. Four 150 H. P water tube boilers are installed arranged on the ring header system. Steam is generated at 125 lbs. pressure gauge and is carried through a steam loop to the engines, with an auxiliary line to the pumps and other apparatus. Included in the latter are two boiler feed pumps 7½ x 5 x 6 in. duplex, good for 175 lbs. working pressure. There are also two house service pumps of the same size, good for 150 lbs. working pressure. The drip pump is of the duplex type 4½ x 3¾ x 4 in. and is good for 100 lbs. working pressure. The two vacuum pumps used in connection with the heating system are single acting, and each is equal in capacity to an 8 x 10 x 12-in. pump.

The feed water heater is of the Cochrane open type combining a feed

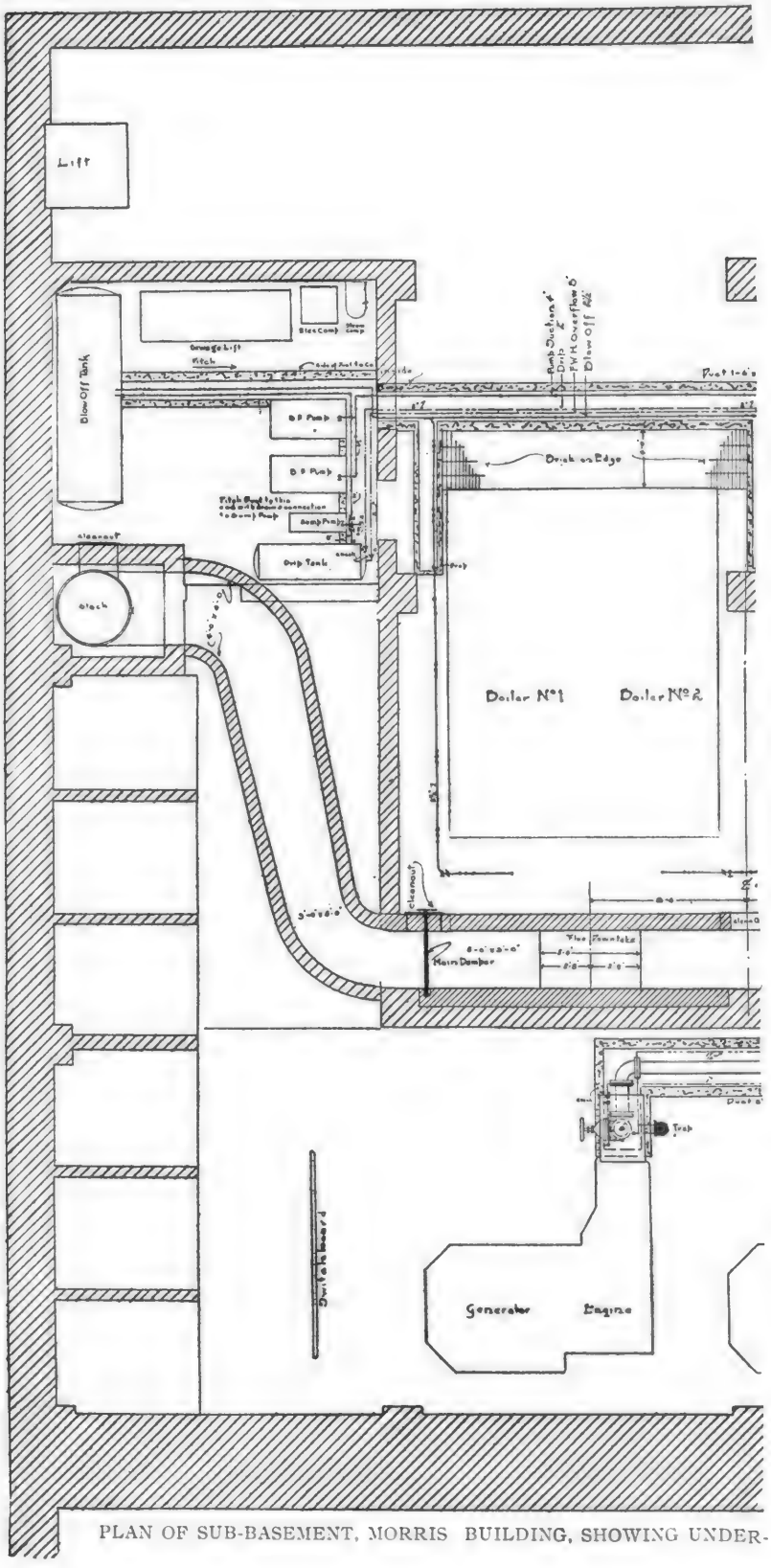


PLAN OF SUB-BASEMENT, MORRIS BUILDING, SHOWING OVERHEAD PIPING FOR POW
PLANT AND MECHANICAL EQUIPMENT

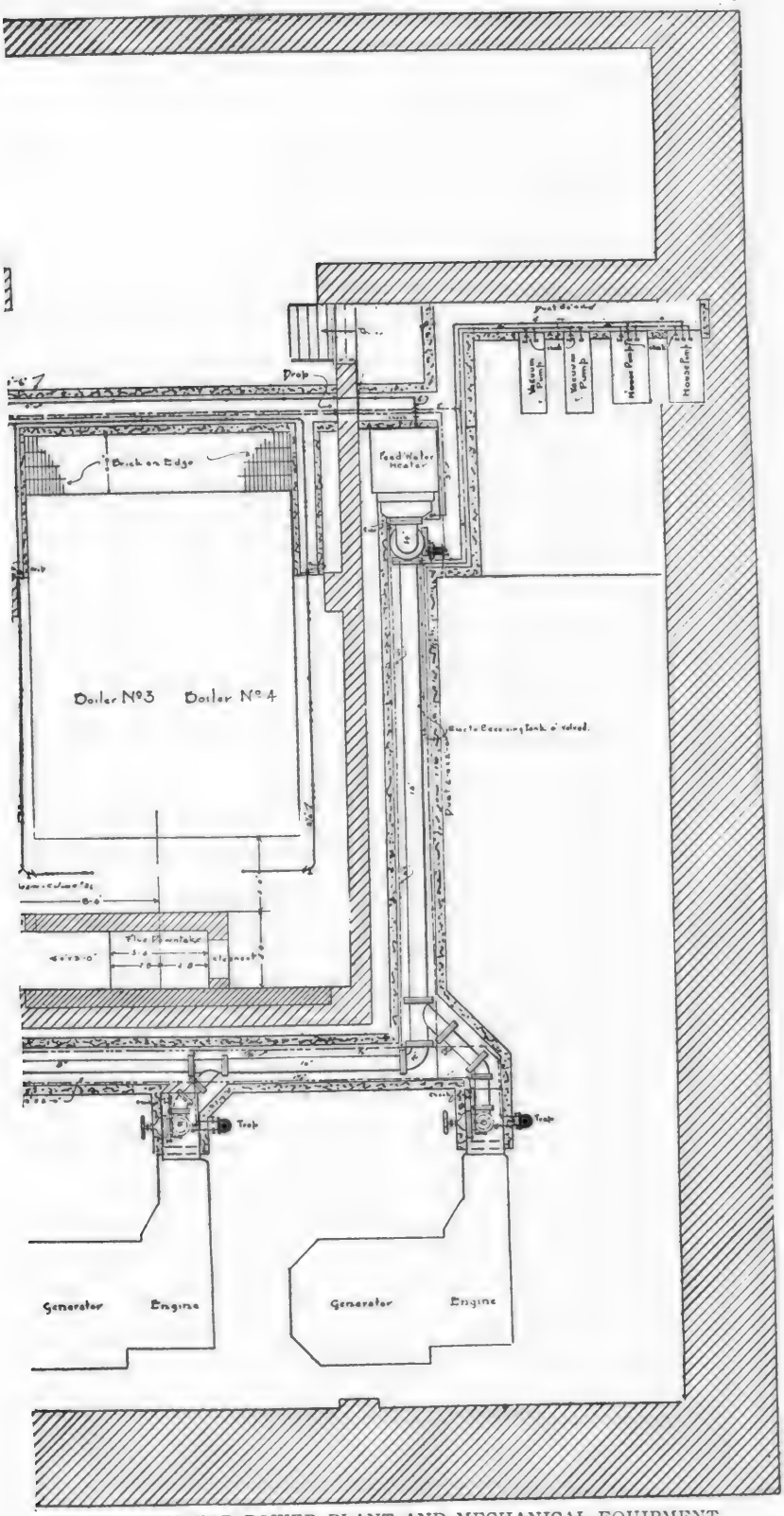




SECTION THROUGH ENGINE AND BOILER ROOMS, MORRIS BUILDING



PLAN OF SUB-BASEMENT, MORRIS BUILDING, SHOWING UNDER-



GROUND PIPING FOR POWER PLANT AND MECHANICAL EQUIPMENT

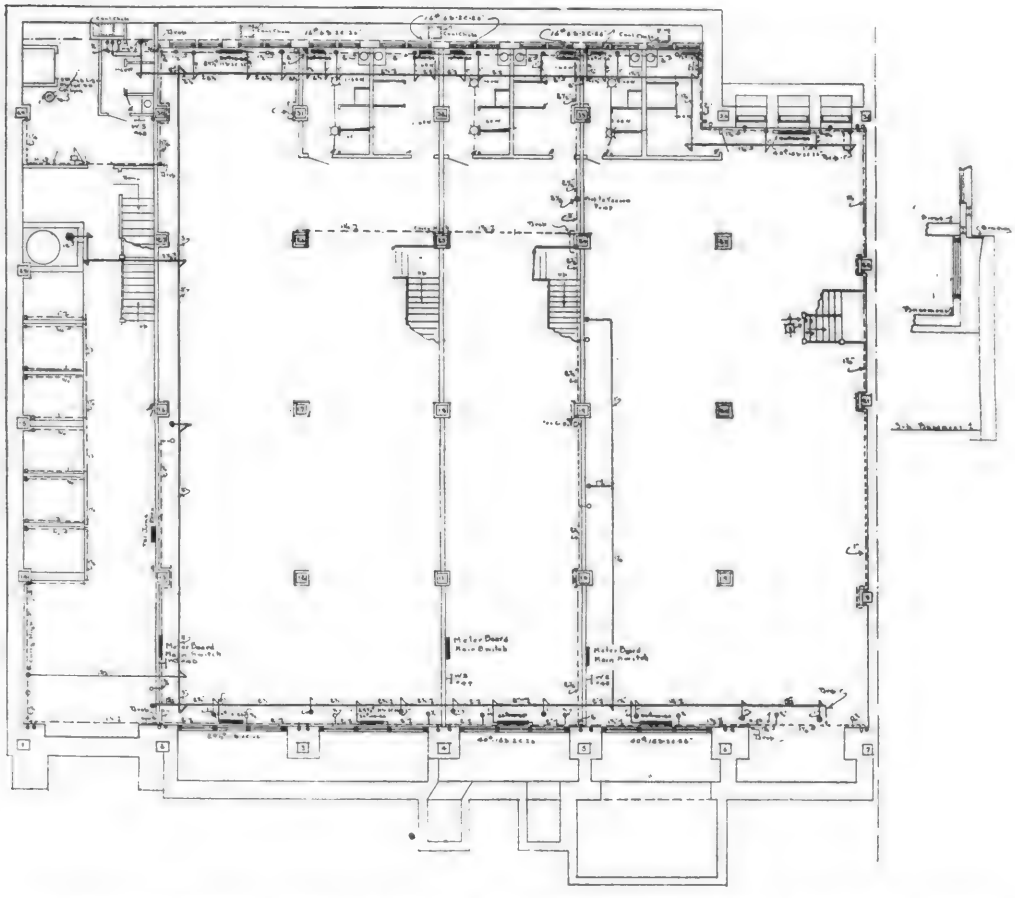
water heater, receiver, separator and purifier. The heater has an oil separator to separate the oil from all exhaust steam and lever valves to cut out the heater and leave the oil separator in service. The heater is of nominal 500 H. P. capacity and is capable of supplying 17,250 lbs. of water per hour at 210° from city water at 50°, when heater is supplied with sufficient exhaust steam. The oil separator is designed of ample size to extract oil and grease from a maximum quantity of steam passing through it.

The hot water generator for the house service has a capacity of 500 gals. and is equipped with two coils, one arranged for exhaust steam and made of the manifold type with 70 sq. ft. of surface and another coil arranged for live steam and having 30 sq. ft. of surface. Both coils are good for a working pressure of 125 lbs.

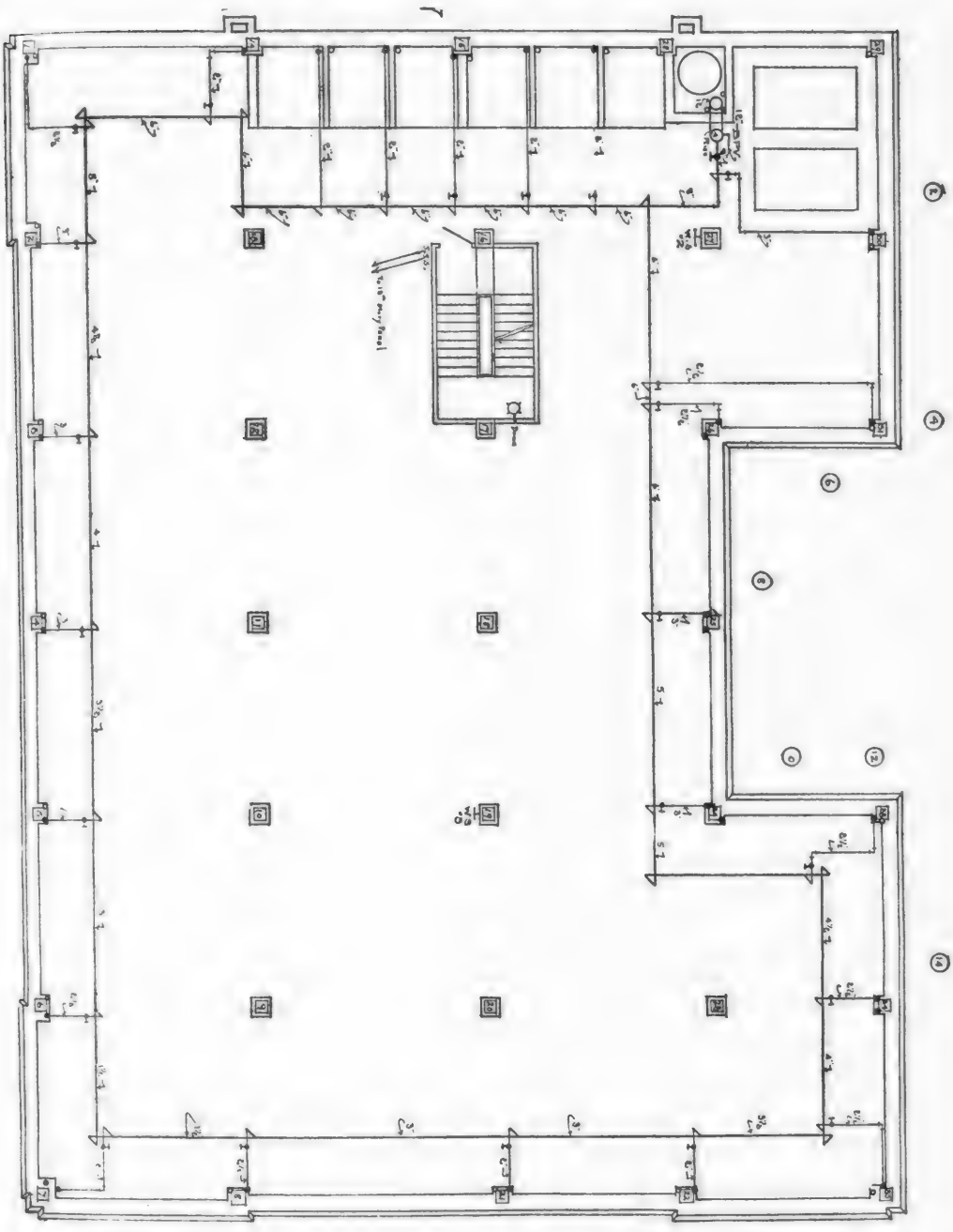
WATER SUPPLY AND BOILER FEED SYSTEM

From a 4-in. city water supply outlet a 2½-in. connection is made to the feed water heater, a 1-in. line to the blow-off tank which is 42 in. long by 12 ft. in diameter; and a ¾-in. line to the drip tank. Interchangeable connections from feed water heater to the two boiler feed pumps are 4 in. in size and the same size connections are made from the water supply pipe to the two boiler feed and the two house service pumps. The house service pump suction is also connected to the receiving tank by a 4-in. line.

The mechanical sweeping system includes a pump of sufficient capacity to



PLAN OF BASEMENT, MORRIS BUILDING, SHOWING STEAM HEATING MAIN AND CONNECTIONS FOR BASEMENT AND FIRST FLOORS



ATTIC PLAN, MORRIS BUILDING, SHOWING EXHAUST STEAM HEATING MAIN AND CONNECTIONS

operate the system with 6 renovators working at one time. This vacuum pump is operated by an electric motor.

ENGINES AND DYNAMOS

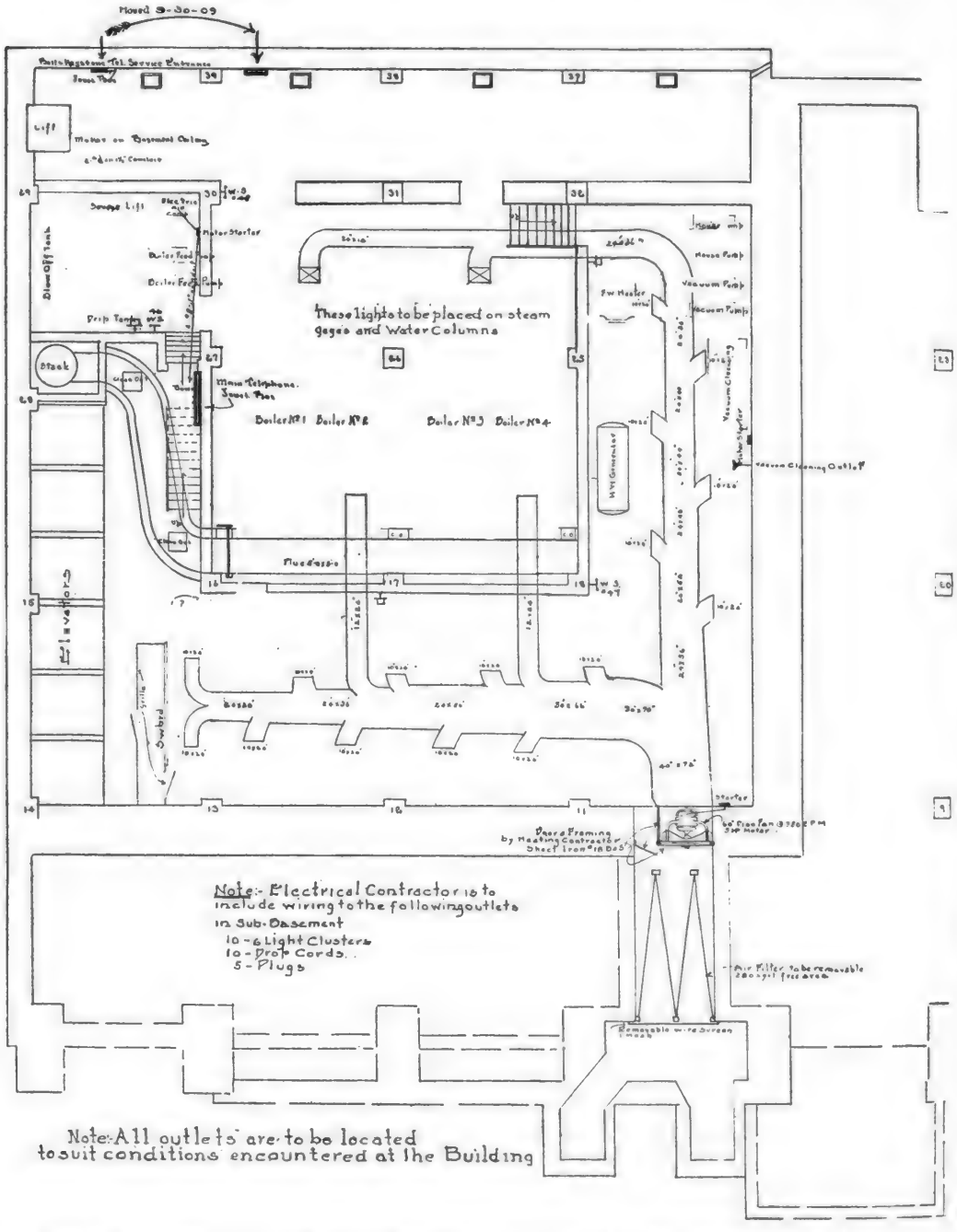
This portion of the mechanical equipment comprises three 150 K. W. generating sets. The engines are of the horizontal Corliss side crank type and deliver 230 H. P. at 200 R. P. M. with steam at 120 lbs. gauge. They are direct connected to three 150 K. W. engine type dynamos of the three-wire type capable of delivering 600 amperes at 230 volts at 200 R. P. M.

The exhaust from the engines and

all pumps and other apparatus is connected through a trench with the main exhaust piping as indicated on the drawings (Pp. 22-23). Connection is run from the feed water heater to the heating system through a 12-in. pipe which extends to the roof through the vent shaft. The pipe from the reducing valves is connected with the main exhaust above the heater.

STEAM HEATING SYSTEM

The building is heated by a two-pipe Webster system. The floors above the first floor are supplied by down-feed system from the mains in the at-


These light to be placed on steam gages and Water Columns
Boiler No 1
Boiler No 2
Boiler No 3
Boiler No 4
Note:- Electrical Contractor is to include wiring to the following outlets in Sub-Basement
10 - 6 Light Clusters
10 - Drop Cords.
5 - Plugs
Note: All outlets are to be located to suit conditions encountered at the Building

PLAN OF SUB-BASEMENT MORRIS BUILDING, SHOWING ARRANGEMENTS FOR VENTILATING BOILER AND ENGINE ROOMS

tic. The basement and ground floor are supplied from mains run overhead in the basement, feeding up and down as shown.

Direct radiators are used throughout the building containing a total of 20,000 sq. ft. of direct radiation.

The supply piping is run from the main exhaust line in the attic branching as indicated, connecting with down feed risers with branch from tee in sub-basement extending to basement. A separate line extends to the hot water generator. The main return lines connect with each vaccum pump through suction strainers and condenser heads. After passing through the vacuum pumps, the condensation is taken into the feed water heater through an air separating tank. On the connection of the main return line to the vacuum pump a line is taken to the pump tank to by-pass the condensation around the pump, for the purpose of blowing out the system.

AIR SUPPLY

An interesting feature of the installation is the arrangement for supplying fresh air to the boiler and engine rooms. Fresh air is taken from the outside at a point near the street level and after passing through a cloth air filter is delivered through a 60-in. direct connected disc fan with motor to run at a speed of 350 R. P. M. The motor is fully enclosed. Air is distributed through ducts at various points in the boiler and engine rooms.

The plant has been in operation for six months, during which time the steam heating system has operated satisfactorily on a pressure of ½ lb.

The architects of the building are Furness, Evans & Co., of Philadelphia. The entire mechanical equipment, including the electric installation, was designed and installed by Francis Bros. & Jellett, Philadelphia.

Heat, Light and Power in Buildings

(*Continued from page* 19)

add to his rental enough to cover the cost of the additional supplies from the outside service he would find that the tenants were just as well served and he, himself, free from all the responsibilities and of the upkeep and replenishment of that plant, which would come about in a short period of time. The actual figures in that case I am sorry to have not with me, but I can say to you that he would gain considerably more by following that plan.

The records show that the use of electricity in apartment houses has become so extravagant that it is now the general practice to make the tenants pay for electric current. Where Mr. Ripley advises the use of a power plant is in such a building where there is a refrigerating plant, but if the refrigerating plant is left out, even he says that it is not a good policy to have an electric plant.

I would like to refer to the matter of exhaust steam, on which Mr. Ripley has presented to you some of the rather fruitful discussions before the American Society of Heating and Ventilating Engineers last year.

That is the subject that has been before my mind for a long time. I had many years ago the experience of an engine breaking down in an engine room, and as an outcome of that accident I had to pay $10,000 over and above insurance on account of the failure to furnish the proper amount of heat, and in my estimation these wonderful instances that were referred to at this society's conventions were not the true state of affairs. There is no virtue in exhaust steam except the moisture; it has, by the time it reaches the riser, 20% of moisture. Considerable moisture is drawn off at the feed heater, but other than that there is no difference between exhaust steam and live steam that reaches the radiator except that the live steam is dry. There are certain conditions affecting that which may make radiators slightly less efficient.

MR WALSH: I think the owner and the manager and everyone connected with that building should be so thoroughly in accord with the economical operation of the building that everything, even if it comes to making soap, if they can do it a good deal cheaper than they can buy it and save a lot of money on it, they ought to make it.

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THAT the general public is at last grasping the principles of heating and ventilating, as understood in the engineering profession, is shown by the more frequent appearance of articles on this subject appearing in the daily press and written from a really scientific point of view. While most of the matter presented is distinctly elementary, as it should be, there is seldom to be found now-a-days such ignorant diatribes as those with which heating engineers of other days had to contend. This is especially true as regards ventilation. The fan system of heating and ventilation, for instance, is no longer a novelty to the public. They have caught the idea. The class of critics is rapidly passing who were wont to pose as "lay experts" on the subject and who took an unholy delight in their attempts to riddle the theory and practice of modern mechanical ventilation. This process of educating the public is now recognized as one of the important methods of advancing the profession, both commercially and scientifically, and the success that has already attended the movement gives a glimpse of the wide field of opportunity still awaiting those engaged in this branch of engineering.

NEARLY everyone has had his laugh at the liberal use often made of arrows to show the course supposed to be followed by air or hot gases through heating apparatus. A writer in the Chicago *Post* shows a keenness that would not ordinarily be looked for in a layman when he says:

"We have sometimes wondered if there was any exercise of the mind more purely speculative than the attempts to work out mechanical systems of ventilation. Given a hall or a public building, the problem is to trace a steady stream of graceful flowing arrows from the outside air through the place, including all the nooks and corners, and out again.

"The more graceful and enterprising the arrows, the better the system. A really good diagrammatic arrow has imagination, indignation, a sense of duty. It gets inside the room or hall and looks around and sees a lot of lowering carbon dioxide in a corner and sweeps straight at it. 'Out with you!' says the ventilating arrow. 'these precincts are mine.'

"Every architect has his quiver full of these arrows, but very few of his clients ever succeed in getting a glimpse of them. Sometimes—it may be—it is their own fault. They don't meet the architect and his arrows half way. They complain of drafts down the back of their necks or around their feet. And in the case of most public halls and schoolrooms the carbon dioxide gets so heavy and inert that it takes complete possession of the place and the fresh air arrows scarcely get a peep within."

The Central Station Point of View

By E. F. Tweedy

Editor's Note.—We are indebted to "Building Management" for the discussion of the subject of "Heat, Light and Power in Buildings," presented herewith. Mr. Tweedy speaks from the central station point of view and his remarks, taken together with Mr. Ripley's paper, printed on another page of this issue, form an interesting symposium on the subject of the central station versus the isolated plant.

Those who are interested in the installation and operation of private generating plants usually find it necessary in connection with their business to earnestly promulgate certain doctrines; for example that depreciation should never be allowed in excess of 5% upon the cost of a plant—which not only means a physical, but also an *economic* life of 20 years; that the investment in boilers and the consumption of coal for the heating of the building only, are almost, if not quite, as great as the corresponding items would be if a generating plant were in operation; that the cost of labor is only slightly greater with a private generating plant than when electrical energy is purchased from a public supply, etc.

While the foregoing usually form the "paramount issues," matters of a subsidiary character are frequently introduced into the platform and are energetically worked until they become too discredited to be of actual service. As an example of this latter class, the present cry that exhaust steam is far preferable to live steam for heating purposes, may be cited. This issue, however, will probably be of even shorter life than was the advocacy of the use of "coke-breeze" as a fuel, which terminated with the somewhat tardy discovery that water was cheaper when purchased by meter than when bought in the form of wet coke.

As an analysis of the figures given on any one of Mr. Ripley's examples will serve almost equally well, the writer will confine himself to Building No. 1, as referred to in the paper of Mr. C. L. Ripley on "Heat, Light and Power in Buildings." The building designated in the paper is the Terminal Building, located at 103 Park avenue, New York City. The cost of the electrical plant is given as $12,000, and some of the items which go to make up this total cost are presented. The cost of the engines is given as $4,750, and that of the dynamos, $4,000, making a total of $8,750 for three generating units of 75 K. W. each. If we take this total from $12,000 we have the sum of $3,250 as representing the cost of the boiler, flue and chimney capacity required for the generating plant in *excess* of that required for a heating plant, the cost of high-pressure and exhaust steam piping and plant auxiliaries, together with the cost of the plant switchboard and wiring—an absurdly inadequate amount.

If a boiler plant had been designed for heating purposes only, in connection with the use of purchased electrical energy, two boilers of 100 H. P. each (one acting as a reserve) would have been amply sufficient. As the present boiler equipment comprises two units of 175 H. P. each, or 350 H. P. in all, it is evident that 150 H. P. is directly chargeable to the generating plant. With the several omitted items properly charged to the generating plant, the cost would be as follows:

Cost of additional boiler, stack and flue capacity required by the generating plant.....	$2,000
High-pressure and exhaust steam piping and plant auxiliaries	4,000
Plant switchboard and wiring.	2,000
Engines (as given).....	4,750
Dynamos (as given).....	4,000
	$16,750

The above total agrees very closely with the figure of $17,000, which was given by Mr. Ripley in a paper which

he read before last year's convention of building managers, as representing the cost of the electric plant in the same building, and included "the cost of one boiler and such part of the steam work and electrical work as would not have been necessary if no plant had been installed."

Possibly Mr. Ripley considers that the plant has depreciated in value during the past year to the amount of $5,000; but this is hardly believable, for 5% (Mr. Ripley's allowance for depreciation) on $17,000 would only be $850.

With interest at 5% and with depreciation taken at 7%—a figure which is used by the best authorities, and which represents a total plant life of over 14 years—the yearly fixed charges (with no allowance for taxes or insurance—either fire or employer's liability) amount to $2,010 instead of $1,200, as given in the paper.

Coming to the item of labor, it would appear that the salary of the "Chief Engineer and the Building Manager" had been overlooked on the plant side of the balance sheet, although it was remembered when estimating the cost "if electricity had been purchased." If we refer to an article by the same author in the *Isolated Plant* for March, 1910, we find a statement of operating costs of this same plant in which the labor item is given in more detail. The following is extracted from the article in question:

"The principal items in the pay roll are:

Assistant engineer	$80
Night engineer	80
Fireman	60
Chief engineer	25

"This latter item comes about in the following manner:

"The superintendent of the building when Edison service was used was receiving $100 per month. When the isolated plant was installed his salary was increased $25 per month and he now performs the double duty of superintendent and chief engineer; therefore it is obvious that expense for chief engineer is only $25 per month for the isolated plant. The $100 is payment for his service as superintendent of building, assisting in renting the offices, attending to complaints of tenants and otherwise directing the scrubbing force, elevator service, etc."

It thus appears that the yearly pay roll at that time, when the output of the plant was somewhat less than it is at present, was $2,640 a year, exclusive of the salary of the chief engineer. Adding his salary of $1,500 a year, the total yearly cost of labor becomes practically $4,200, or about $1,000 a year more than the figure of $3,217, which was given by Mr. Ripley in his recent paper. The amount of labor, moreover, is inadequate for a plant of this size and for a building of this character. A night fireman, at least, should be added, so that the night engineer could be relieved of the work of attending to the boilers and left free to properly clean and make any necessary repairs and adjustments upon the engines and generators.

In the article referred to, from which the above extract is taken, it is clearly stated that the engineer and building manager only received $1,200 a year when the Edison service was in use, although in "the estimated cost, if electricity had been purchased," this item appears as $1,500.

The cost of coal for heating this building, with electricity purchased, is estimated in the paper at $2,000 a year, evidently with coal at $2.25 per ton, judging from the article above referred to. In other words, it is estimated that this building would require, for heating purposes alone, some 900 tons of coal per year, which is more than double what a building of this size, and having the wall and glass exposures of this one, should require, with a boiler plant properly designed and efficiently operated. If the yearly consumption of coal was in excess of 400 tons for heating alone when electricity was purchased, it would seem to indicate that something was at fault in the management of the building.

The cost of water for the boilers chargeable to the plant should be $200 instead of $100, as given in the paper.

The combined cost of repairs, supplies, removal of ashes, etc., is given by Mr. Ripley as $851. It is evident that the present yearly cost of repairs does not fairly represent what the average yearly repairs will be during the life of the plant.

After making the various corrections outlined above, the yearly operating costs, with and without a generating plant, are found to be as follows:

GENERATING PLANT

Coal	$3,098
Wages	4,140
Water for boilers	200
Repairs, oil, ash removal (in excess of heating plant) and miscellaneous (not including lamps)	851
Total	$8,289
Less sale of electricity	400
	$7,889
Add 12% of plant cost	2,010
Net cost	$9,899

PURCHASED ELECTRICITY

Coal, 400 tons at $2.25	$900
Fireman, 8 months	400
Engineer and building manager	1,200
Electricity, 156,340 K. W. hrs., at 5c per K. W. hr.	7,817
Care of elevators, heat and plumbing and wiring repairs (estimated)	300
Oil and grease	50
Total	$10,667
Less sale of electricity	400
	$10,267

The above estimates in their corrected forms show a possible saving of $360 a year from the operation of a generating plant—quite a different matter from the $3,600 which is claimed by Mr. Ripley. As a matter of fact, if this plant were properly designed and operated, the yearly cost of its operation would be considerably in excess of the cost with purchased electricity, as some of the following considerations should make clear.

No storage battery has been provided in connection with this plant, although the need for one is fully as great as in the other buildings mentioned in the paper where batteries are provided. The effect of the elevators upon the lighting service is very noticeable to anyone who has occasion to visit this building. With a storage battery of proper capacity installed, the additional fixed charges plus the cost of battery renewals, would amount to approximately $1,000 a year, and this amount should be added to the plant operating cost as given above.

A building of this character should be provided with what is known as a "break-down" connection to provide against the disability of the entire plant by a bursting steam main or engine fly wheel, or due to a failure in the water supply. The generating plants of several prominent buildings in New York City have been entirely crippled from one or another of the foregoing causes within the past few years, and means should be provided for operating at least one elevator and a comparatively small number of lights in the event of an emergency of this kind.

As mentioned above, the amount of plant labor is inadequate at the present time and a night fireman should be added to the present staff, thereby increasing the labor item by some $700 a year.

No allowance has been made for the item of taxes or insurance on the plant valuation. Whether employer's liability insurance is carried or not, the employment of labor in connection with a generating plant involves a risk which is a distinct liability and which should be capitalized as such. Since the recent amendment of the Employer's Liability Act and the passage of the Compulsory Compensation Law by the Legislature of the State of New York, the rates for liability insurance for electric power plant operatives have been materially increased.

While it would be difficult to state the exact money value of the space which the generating plant occupies, it should be evident, at least to those

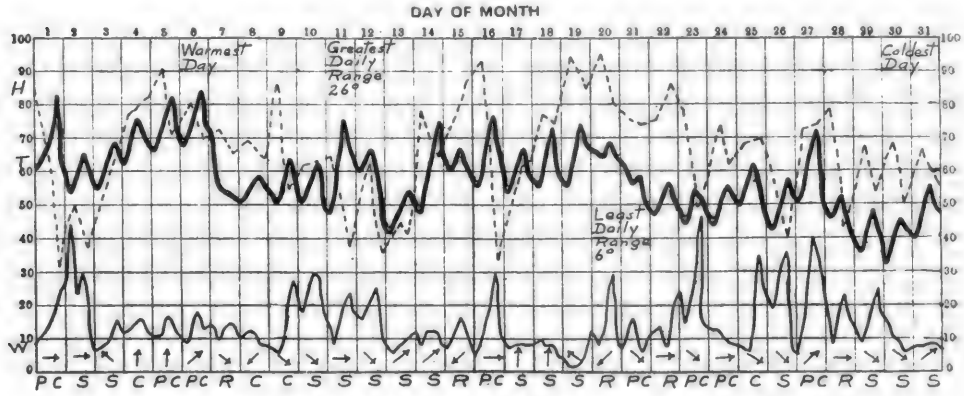
who have a knowledge of building rentals, that this space—located within a building such as the one under consideration—is possessed of some earning value, the amount of which should be directly charged against the operation of the plant.

If we include such items as are given above, we find that the net yearly cost of operating the generating plant is increased to an amount which is considerably in excess of what the yearly cost would be with electricity purchased.

The present writer has confined himself to a "dollars-and-cents" comparison solely, and has not considered in any way the many advantages which invariably accompany the use of purchased electricity—advantages which are now very generally recognized by the great majority of building owners and building managers. If this latter statement requires any confirmation, it is to be found in the fact that the owners of 96¾% of all the buildings erected in New York City during the year 1909 found it to their advantage to adopt the central-station service for their supply of electric light and power.

The Weather for October

The weather during October, 1910, in most parts of the country was unusually mild, the first part of the month being so warm as to require little if any house heating The latter part of the month was considerably colder, although the mean temperature for the


DAY OF MONTH
Warmest Day
Greatest Daily Range 26°
Coldest Day
Least Daily Range 6°
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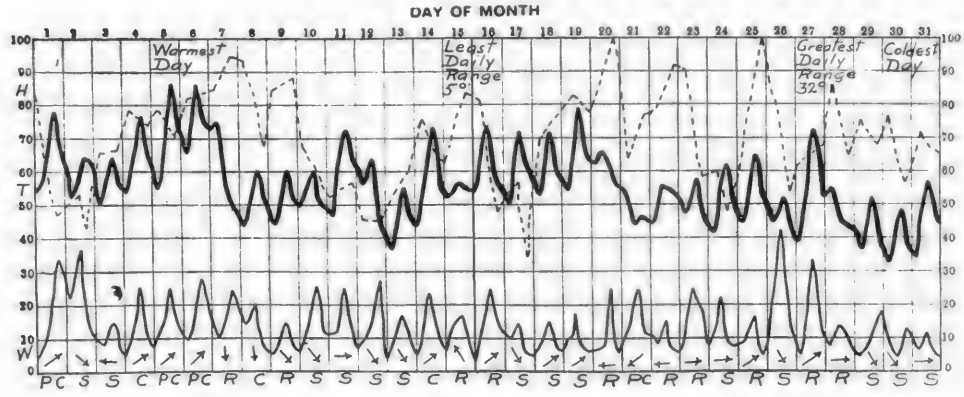
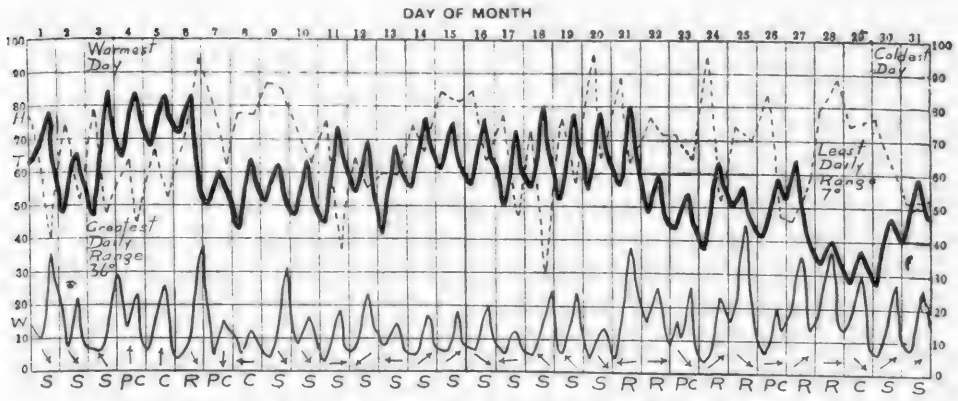
RECORD OF THE WEATHER IN NEW YORK FOR OCTOBER 1910

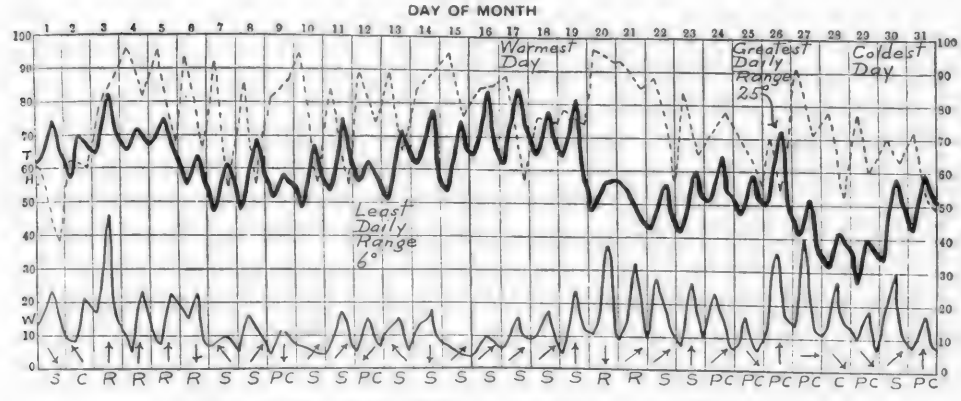

DAY OF MONTH
Warmest Day
Least Daily Range 5°
Greatest Daily Range 32°
Coldest Day
H
T
W
PC S S C PC PC R C R S S S S C R R S S S R PC R R S R S R R S S S

RECORD OF THE WEATHER IN BOSTON FOR OCTOBER, 1910

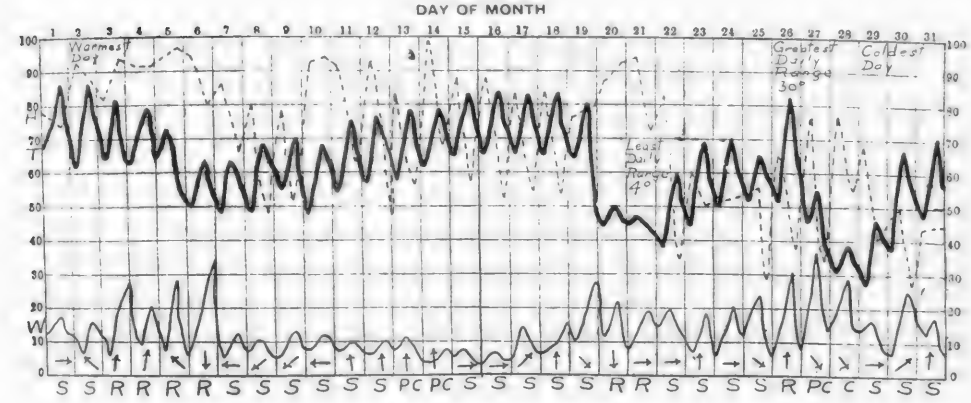
Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage.
S—clear, P C—partly cloudy, C—cloudy, R—rain. Sn—Snow.
Arrows fly with prevailing direction of wind.



RECORD OF THE WEATHER IN PITTSBURG FOR OCTOBER, 1910



RECORD OF THE WEATHER IN CHICAGO FOR OCTOBER, 1910



RECORD OF THE WEATHER IN ST. LOUIS FOR OCTOBER, 1910

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.

Heavy lines indicate temperature in degrees F.

Light lines indicate wind in miles per hour.

Broken lines indicate relative humidity in percentage.

S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—Snow.

Arrows fly with prevailing direction of wind.

month ran from 2° to nearly 5° above the normal mean temperatures.

NEW YORK

Highest temperature during October, 83° on the 6th; lowest temperature, 32° on the 30th; greatest daily range, 26° on the 11th; least daily range, 6° on the 20th. Mean temperature for the month, 58°, 2.4° above the mean of this month for 40 years. Total rainfall, 3.79 in, which is close to normal. Total wind movement, 9,421 miles, mostly from the northwest; average hourly velocity, 12.7 miles. There were 14 clear days, 9 partly cloudy and 8 cloudy. Rain fell on 5 days.

BOSTON

Highest temperature for the month, 85° on the 5th; lowest temperature, 33° on the 30th; greatest daily range, 32° on the 27th; least daily range, 5° on the 15th Mean temperature for the month, 50°, 3° above the mean of this month for 40 years. Total rainfall, 1.14 in., which is 2.55 in. less than usual. Total wind movement, 8,540 miles, mostly from the southwest. Average hourly velocity 11.5 miles. There were 14 clear days, 5 partly cloudy and 12 cloudy. Rain fell on 10 days.

PITTSBURG

Highest temperature, 84° on the 3d; lowest temperature, 28° on the 30th; greatest daily range, 36° on the 3d; least daily range, 7° on the 28th. Mean temperature for the month, 58°, 3.2° above the mean of this month for 40 years. Total rainfall, 1.69 in., 0.63 in. less than usual. Total wind movement, 8,136 miles, mostly from the northwest; average hourly wind velocity, 10.9 miles. There were 19 clear days, 4 partly cloudy and 8 cloudy. Rain fell on 9 days.

CHICAGO

Highest temperature, 84° on the 17th; lowest temperature 27° on the 29th; greatest daily range, 25° on the 26th; least daily range, 6° on the 12th. Mean temperature for the month, 58°, 4.8° above the mean of this month for 40 years. Total rainfall, 1.79 in., 0.78 in. less than usual. Total wind movement, 8,313 miles, mostly from the southwest; average hourly velocity, 11.2 miles. There were 14 clear days, 12 partly cloudy and 5 cloudy. Rain fell on 9 days. There were traces of snow on the 27th and 28th. The month in Chicago was the warmest since 1900, the temperature during the first 26 days being almost continuously above the normal.

ST. LOUIS

Highest temperature, 86° on the 2d; lowest temperature, 28° on the 29th; greatest daily range, 30° on the 26th; least daily range, 4° on the 21st. Mean temperature for the month, 61°, 2° above the mean of this month for 38 years. Total rainfall, 3.98 in., 1.61 in. more than usual. Total wind movement, 7,297, mostly from the south; average hourly wind capacity, 9.8 miles. There were 22 clear days, 5 partly cloudy and 4 cloudy. Rain fell on 8 days.

Nominees for 1911

The following nominations have been made for officers of the American Society of Heating and Ventilating Engineers. The election will be by mail ballot and the result will be announced at the annual meeting of the society, January 24-26, 1910:

FOR PRESIDENT

Reginald Pelham Bolton, New York.
B. F. Stangland, New York.

FOR FIRST VICE-PRESIDENT

S. R. Lewis, Chicago.
D. M. Quay, New York.

FOR SECOND VICE-PRESIDENT

Albert B. Franklin, Boston.
F. R. Still, Detroit, Mich.

FOR SECRETARY

William M. Mackay, New York.
(*To be announced.*)

FOR TREASURER

U. G. Scollay, Brooklyn, N. Y.
D. D. Kimball, New York.

REGINALD PELHAM BOLTON

Reginald Pelham Bolton, one of the candidates for president, has been a member of the society since 1897. He has been engaged in the business of consulting heating and ventilating and mechanical engineering for many years in New York. Mr. Bolton has been a frequent writer on engineering subjects and has been a contributor at various times to THE HEATING AND VENTILATING MAGAZINE. He has also presented a number of papers before the heating eningeers' society, his subjects including "Circulation of Steam for Heating Purposes at or Below the Pressure of the Atmosphere," "The Element of Time in Contracts," "Depreciation, Maintenance and Interest Charges," "The Smoke and Gas Flue System in the Ansonia Apartment Hotel, New York," "Steam Heating in Connection with Condensing Engines."

Mr. Bolton served on the board of governors of the society in 1901 and was elected second vice-president in 1903. He became first vice-president in 1905.

B. F. STANGLAND

B. F. Stangland, also candidate for president, is a charter member of the society. He is well known as one of the prominent mechanical, heating and ventilating engineers in New York and has long been the mechanical expert for Howard & Morse, manufacturers of ventilating fans.

Mr. Stangland served on what was then known as the board of managers of the heating engineers' society in 1895. The next year he was elected a member of the council, upon which he served in 1896 and 1897. He was again elected to the council in 1899. In 1905 Mr. Stangland became a member of the society's board of governors, being re-elected in 1906. In 1908 he was elected vice-president of the society and is at present a member of the board of governors.

Annual Meeting of Illinois Chapter

The annual meeting and election of officers of the Illinois Chapter of the American Society of Heating and Ventilating Engineers was held October 10, 1910. This meeting was preceded by a banquet at which 75 per cent. of the membership was present. The business meeting consisted of reports from the officers and various committees and was followed by the installation of the newly-elected officers for the coming year, as follows:

President, Norman L. Patterson; vice-president, Samuel R. Lewis; treasurer, August Kehm; secretary, John F. Hale; board of governors, Edmund F. Capron, George J. Phillips and Charles F. Newport.

A general discussion of engineering matters occupied the greater part of the evening and plans were made for a year of research, tests, experiments and reading of papers that indicate an increased interest in the society's work.

Superiority of Exhaust Steam in Heating

In discussing the greater efficiency of exhaust steam for heating purposes over live steam, Percival Robert Moses, of New York, advances this interesting theory:

"My theory, at least partly explaining the phenomenon, is that exhaust steam has a pulsating pressure varying rapidly under certain conditions from nothing to 2 to 3 lbs. per square inch. The steam gauge registers the average pressure. So 1 lb. gauge pressure of exhaust steam may have instantaneous impulses as high at 2 lbs., or more. Thus the circulation is increased in the pipes; particles of air are dislodged and carried through, which otherwise would stay on the inside of the radiators, despite the steady flow of steam from the boiler, and the steam circulates better. This is on the same principle that in opening a door which sticks, or in loosening a nut which is rusted, a sharp, quick impact will often accomplish the purpose when a steady push or pull is insufficient."

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CENTRAL STATIONS.—Central-Station at Attleboro, Mass. Illustraed description of a station where steam turbines displaced reciprocating engines in an installation of moderate size. 2500 w. Elec. Wld—Sept. 15, 1910. 20c.

Turbine Station of the Bisbee Improvement Company. I. A. Rosok. Gives results obtained in the operation of a small Arizona oil-burning plant, with details of losses and their distribution. Ills. 2000 w. Elec Wld—Sept. 22, 1910. 20c.

Gas and Oil-Burning Electric Power Station. Illustrates and describes the modern equipment of the Light and Traction Co., of Fort Smith, Ark. 2500 w. Elec Wld—Sept. 1, 1910. 20c.

ISOLATED PLANTS.—A Recent Isolated Plant Installation for Country Residence Lighting. W. D. Cassin. Brief description of a plant for an estate near Annapolis, Md. 500 w. Elec Wld—Sept. 8, 1910. 20c.

The Power Plant of the Bigelow Carpet Company. Illustrated description of a new plant at Clinton, Mass., to run two mills an eighth of a mile apart. 1800 w. Eng Rec—Sept. 17, 1910. 20c.

MECHANICAL PLANTS.—A modern Combination Utility Plant. Illustrated description of an electric-generating, steam-heating, refrigerating and cold-storage plant at Detroit. 4000 w. Elec Wld—Sept. 1, 1910. 20c.

POWER PLANTS.—Metropolitan Home Office Plant. F. L. Johnson. Illustrated description of the power plant equipment of the tallest office building in the world, and some of the leading feaures of the building. 2200 w. Power—Sept. 20, 1910. 20c.

Properties and Characteristics of Ozone

Ozone O_3 is an allotrophic modification of Oxygen O_2. Density is 1.5 as compared to oxygen, 1.66 when compared to ordinary atmosphere.

It is soluble in water and highly soluble in certain oils; it reverts to oxygen at 270° Centigrade—is unstable and rapidly disintegrates. Can be condensed to a liquid state of a bluish color with a specific gravity of 1.46. In this state it boils at about 120° Centigrade.

It will attack all oxidizable and especially organic (carbon or compounds of carbon) matter.

Its value as an oxidizing agent is due to ease of application and because nothing but oxygen is used in the reaction.

Can be detected by its odor when present in only 1 part (by volume) to 10,000,000 parts of air.

Is chiefly generated in Nature by the ultra-violet rays of either sunlight or electricity acting upon the oxygen of the air.

Is found more abundantly in the lighter air strata and near large bodies of water and forests, especially of the fir family.

The Vohr Ozone Maker

Purifying air by the production of ozone has reached an interesting point in its development through the perfection of a machine which is a fan and ozone maker combined. This apparatus is known as the Vohr Ozone Maker and is made by the Standard Electro-Utilities Co., 312-314 Fifth avenue, Chicago, Ill. As will be seen

INTERIOR VIEW OF VOHR OZONE MAKER

from the accompanying illustration the Vohr ozone maker has but one unit and in its operation provides for the briefest period of ozonization (air contact with electric glow) which adds to the purity of the product. It also renders drying of the air unnecessary.

The Vohr machine is specially designed to produce ozone of mild concentration, of a strength recommended by leading European scientists as correct for continuous breathing purposes. The fan serves to make the outflow of ozonized air continuous and uniform. The machine is operated by means of a plug inserted in an ordinary electric light socket. The fan is charged with electricity raised to a higher voltage by a transformer wound with almost 11 miles of wire. Surrounding the fan is what is termed the dielectric ring or band. It is made of a high insulating material. Outside of this dielectric band is still another ring made of metal and charged with electricity. Between the dielectric and the fan shoes is a space called the air gap.

When the fan revolves, since both it and the outside metal band are charged with electricity, a purple electric glow appears in the circular air gap, which may be easily seen in the dark. The air passing through this electrified field is purified and a certain quantity of ozone produced in it.

In front of this fan is a supplementary one which is designed to increase the air flow and to protect the machine from damage by preventing the entrance of anything from the outside. With these fans the Vohr apparatus generates and discharges, according to type of generator, from 8,000 to 20,000 cu. ft. of ozonized air per hour, which in turn mildly ozonizes several times this volume of additional air.

Acme Air Purifying and Cooling System

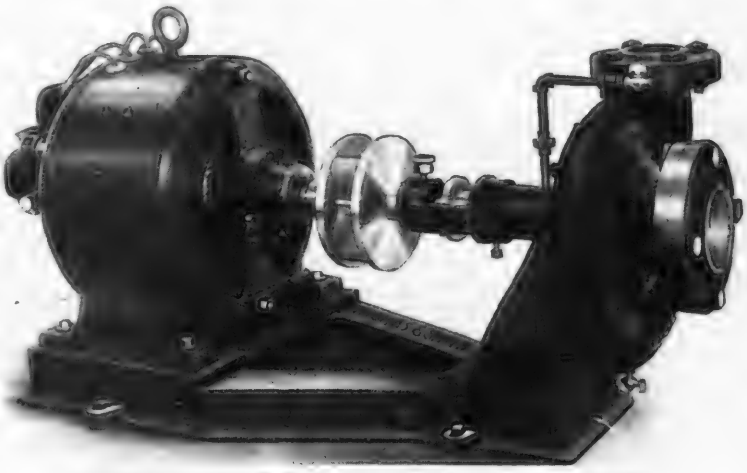
The latest types of the Acme Air Purifying, Humidifying and Cooling System, manufactured by Thomas & Smith, Chicago, are illustrated herewith. The general features of this well-known apparatus have already been described in our columns, and it will suffice to recall that the air washer is built on most approved lines, consisting of a storage or settling tank, a spray chamber or wash box, an eliminator, a system of spray piping with automatic flush out heads, a water circulating pump, a suction strainer, a flush out pipe and a fresh water supply pipe with automatic valve to keep an even level of water in the tank.

Two of the most interesting features of the Acme apparatus are the sprayheads and the water circulating pump.

The spray system consists of pipes arranged with spray nozzles to throw separate and distinct solid sheets of water across the entire spray chamber.

A series of bar lock circular spoon nozzles are constructed of brass and are set in such relation to each other that the velocity of the air through the water curtains is even and uniform, to the end that each cubic foot of air comes in direct contact with the required quantity of water to wash and saturate it com-

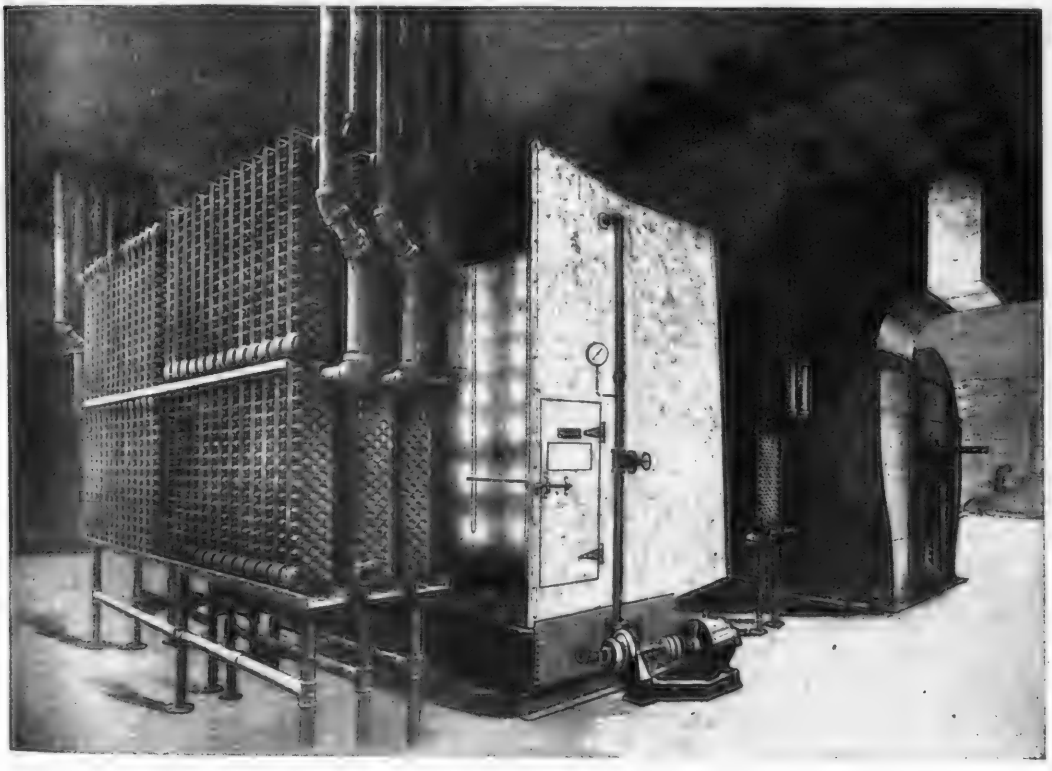
pletely: Hence, every cubic foot of air is evenly treated. These nozzles are provided with spoons and shifting levers for flushing and cleaning the spray nozzles. The automatic operating mechanism is arranged so that the flushing may be timed to any desired interval, and operated devices are also provided and when these are used the nozzles should be blown out at least twice a day.



ECONOMY DIRECT CONNECTED CIRCULATING PUMP

The pump supplied with the Acme system known as the Economy is of the company's own manufacture and is especially designed for this work. It is of the centrifugal type with specially shaped runner or impeller.

These pumps are so built that no second bearing or fixture of any kind is bolted separately to the bed plate to receive the end thrust. This is accomplished by hardened steel bearings contained in a cage secured to the prime or principal member of the pump. This construction allows of no give or play, which is encountered in designs wherever a separate bearing or member is bolted independently to the bed or foundation plate.



TYPICAL INSTALLATION OF THE ACME AIR WASHER, READY FOR SHEET METAL CONNECTIONS

The pumps are all fitted with water-cooled bearings, circulation for which is provided by the pump itself. Thus, they are free from that objectionable feature of water finding its way through the oiling devices and flooding the floors immediately adjoining the pump. All ports and water passages are ample. Pillows, pump stands, casings and covers are all thoroughly machined and made true and aligned. Those parts subjected to the strain of pipe connections are especially proportioned. Thus, the Economy pump is practically free from lateral strains, which multiply friction so rapidly.

Trade Literature

Sturtevant Ventilating Fan, multi-vane type, made by the B. F. Sturtevant Co., Hyde Park, Mass., is featured in one of the King booklets, illustrating and describing the new Pennsylvania Railroad station in New York City. This station is ventilated by 36 fans of the Sturtevant multi-vane type, in various sizes, all driven by electric motors, entirely changing the air of the station every half hour.

Valve World for October, 1910, described, among other things, the Los Angeles Water System, which it characterizes as one of the most marvelous engineering feats the world has ever known. In "Real Builders of America" sketches are presented of William and Coleman Sellers, the "fathers of the great machine tool industry of the world."

The Richardson Manual, an illustrated price list of steam and hot water boilers, has just been published by the Richardson & Boynton Co., New York. It is a publication that will be of the greatest practical value to the estimator and designing engineer, as well as to the contractor, for it presents in exceptionally convenient form prices, capacities, dimensions, etc., covering the full line of Richardson boilers. The book is profusely illustrated with photographic reproductions of the company's various types of boilers, as well as line drawings showing the points of measurement of each type. Twenty-six pages of the manual are devoted to miscellaneous information and rules pertaining to steam and hot water heating. This includes rules for determining amount of direct radiation required in house heating, air in cubic feet cooled by glass and equivalent glass, tables of cubical contents, size of mains, number and sizes of branches main will supply, size of expansion tanks required, B. T. U. required for heating air, weights of galvanized iron pipe, square feet of radiating surface of pipe per lineal foot, dimensions of standard pipe, heat units in water, pressure of water for each foot in height, chimney flues, table of expansion of wrought iron pipe, capacities of tanks, velocity of flow of water, areas of circles and other miscellaneous information. Size, 3 x 6 in. (Standard). Pp. 75.

Institution of Heating and Ventilating Engineers (of England) held its autumn meeting October 18 in London. Two papers were read, one by Frederick Dye on "Fuel Consumption in Its Relation to Hot Water Installations as Fixed in Residences," and the other, by C. R. Honiball, on "The Humidity of Air." The latter is a continuation of Mr. Honiball's discussion of the subject at the institution's summer meeting.

Winnipeg, Man.—Winnipeg is to have a peat fuel plant with a 100,000 ton capacity. L. B. Lincoln, of the International Peat Co., and also vice-president of the Canadian Peat Society, has lately made an investigation and survey of the peat deposits in the vicinity of Winnipeg with the result that a company is being organized to develop the industry at that point.

W. H. Schott Co., Chicago, has purchased the light, heat and power properties at Streator, Ill., for $50,000. The property includes the electric lighting and power plant now operated at the Heenan store, which furnishes light, heat and power for this store, as well as the Plumb Hotel and several other establishments in the business district.

Pressed Radiator Company of America, Pittsburg, Pa., announces a large increase in its manufacturing facilities to take care of its rapidly expanding business. Several months ago, the company placed an order with the E. W. Bliss Co. for three large geared presses, weighing approximately 25 tons each. These presses are now being installed in the factory and will finish out the line of twelve large presses necessary to give one press for each of the eleven operations to complete a radiator unit, with one press for spare; thus, making the operations continuous and incidentally doubling the daily output. The assembling, finishing, testing and shipping departments have all been enlarged so as to bring them up to the same daily capacity as the press department. This is the second time, during the current year, that the manufacturing facilities of this company have been practically doubled. During the month of October the company reports that the actual shipments were the largest in its history, while the orders booked during the same month exceeded the shipments by 60%.

TRADE AND MISCELLANEOUS NOTES

Coming Events

Dec. 5-9, 1909.—Annual meeting of the American Society of Refrigerating Engineers in New York.

Dec. 6-9, 1910.—Annual meeting of the American Society of Mechanical Engineers, New York. Headquarters at the Engineering Societies Building, 39 West 39th Street.

Dec. 7-10, 1910.—Annual meeting of the American Institute of Chemical Engineers, Philadelphia, Pa.

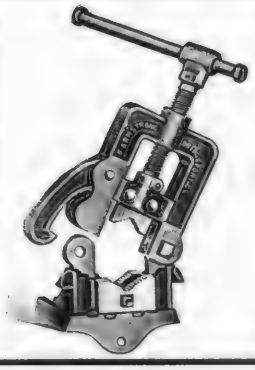
Jan. 24-26, 1911.—Seventeenth annual meeting of the American Society of Heating and Ventilating Engineers, New York. Headquarters at the Engineering Societies Building, 39 West 39th Street.

Deaths

Charles W. Woodward, formerly secretary of what is now known as the Eastern Supply Association, died at his home at Stanton Hill, N. Y., Oct. 16. He was 59 years old. Mr. Woodward was a well-known figure in the trade, having been connected successively with Charles Harrison & Co., of New York; Haines, Jones & Cadbury Co., of Philadelphia; the Buick & Sherwood Mfg. Co., of Detroit, and the Standard Sanitary Mfg. Co., of Pittsburg. He was appointed secretary of the Association of Manufacturers and Jobbers of Plumbing Supplies in 1900, now known as the Eastern Supply Association, and was also secretary of the National Committee of the Confederated Supply Associations, whose headquarters were at 256 Broadway, New York. He resigned both positions in 1906.

Miscellaneous Notes

Eastern Supply Association held its annual meeting at the Hotel Astor, New York, Oct.. 12. A feature of the proceedings was a number of addresses, including one on "The Value of Organiza-



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For all classes of Marine and Stationary Engines and Pumps

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tion," by Marshall Cushing, representing the Employers' Associations. Officers were elected for the ensuing year as follows: President, P. M. Beecher, Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y.; first vice-president, John A. Murray, New York; second vice-president, F. H. Locke, Locke, Stevens & Co., Boston; secretary, Frank S. Hanley, New York; treasurer, Martin Behrer, Behrer & Co., New York. Board of directors: the above-named officers and W. L. Blake, Portland, Me.; John McClure Chase, Philadelphia; Frank Dows, Philadelphia; G. R. Adams, Rochester, N. Y.; Leon Ballou, Buffalo, N. Y.; John Mitchell, Jr., Washington, D. C., and A. A. Tomlinson, Norfolk, Va

United Bunch of Sheep, Milwaukee Home Fold No. 1, held a meeting, followed by a dinner, at its club rooms in the St. Charles Hotel, Milwaukee, Oct. 7. Past Grand Ram J. F. Wulf was the toastmaster at the dinner which was largely attended.

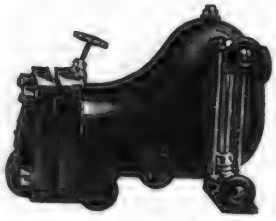
September Building Operations in 47 cities showed a decrease from those for the same period in 1909. In the eastern cities the decrease was 9%; middle western cities, an increase of 6%; southern cities, a decrease of 33%, and Pacific Coast cities, a decrease of 13%. The figures for Manhattan and the Bronx for 1910 were $7.717,025 as compared with 6,-59,875 in 1909. Philadelphia and Chicago also showed a gain, while Pittsburg fell off from $1,996,261 in 1909 to $835,800 in 1910.

Richard D. Kimball Co., Boston and New York, designing engineers for mechanical and electrical equipment, have established a department for testing and inspecting the operation of power plants. The department is in charge of S. H. Brooks, formerly New York manager for the Pressed Radiator Co. of America. The new department is located at the New York offices of the Richard D. Kimball Co., at 437 Fifth Ave.

Instruction in Heating and Ventilation is being given in a course to continue through the Fall and Winter at the Harlem Branch of the Y. M. C. A., 3 West 125th St., New York. The course is under the direction of James A. Donnelly, of New York, and C. A. Fuller, a graduate of the University of Michigan. The instruction is in the form of lectures, demonstrations of systems and appliances, supplemented by a question box. During the first part of the year, gravity steam and hot water heating and ventilating apparatus will be taken up. During the second part of the year the fan

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

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High Grade Expansion Joints

We manufacture expansion joints for inside, outside and underground work. In all sizes from 1 to 30". Our experience covers a period of over thirty years. Let us figure on your requirements.

Write for Bulletin 104

American District Steam Co.

Lockport, N. Y. Chicago, Ill.

systems of heating and ventilating, and the heating and ventilating of office buildings, hotels, factories, etc., will be covered. The class meets Saturday evenings, beginning Oct. 15.

Monticello, Ia.—Work has been started on the new heating plant which will heat the public school buildings in Monticello.

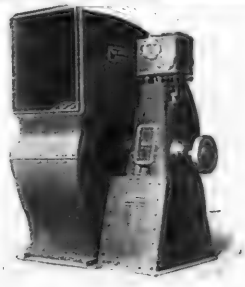
Newark Association of Master Steam and Hot Water Fitters will hold its sixth annual banquet Wednesday evening, Dec. 7, at Davis's Parlors, 943 Broad St., Newark. This event is always a notable one in New Jersey's heating trade and a large attendance is anticipated.

Modern Science Club, Brooklyn, N. Y., whose club-house is located at 125 South Elliott Place, announces the following meetings for November: Nov. 5, illustrated lecture on "The Panama Canal," by N. B. Payne, of Manning, Maxwell & Moore; Nov. 22, illustrated lecture on "Injectors," by Frank J. O'Leary, mechanical expert of the Penberthy Injector Co.; Nov. 25, illustrated lecture on "A Modern Hydraulic Installation," by George A. Orrok, mechanical engineer for the New York Edison Co.

Manufacturers' Notes

McCrum-Howell Co., New York, and the Model Heating Co., Philadelphia, in a joint announcement dated November 1, 1910, confirm the sale of the Model Heating Company to the McCrum-Howell Co., as foreshadowed in our last issue. The McCrum-Howell Co. will continue the manufacture of the Model boilers and radiators and will retain the entire sales organization of the Model Heating Co. Announcement is also made that the McCrum-Howell Co. has taken over the Cameron-Schroth-Cameron Co., of Chicago; the American Air Cleaning Co., Milwaukee; the Vacuum Cleaner Co., New York, and the Sanitary Devices Mfg. Co., San Francisco. At a stockholders' meeting, October 25, in Norwich, Conn., an increase of $4,000,000 in the company's capital stock was authorized, divided equally in common and preferred, raising the company's total capitalization to $7,000,000. Of the $2,000,000 new preferred, $850,000 is for the purchase of the companies named.

Schade Valve Mfg. Co., Philadelphia, has purchased a factory on American street, near Huntingdon, which it will occupy on the completion of improvements. The factory is a three-story building on a lot 100 x 111 ft.



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It is carefully designed and rigidly constructed.

Our engineers will make recommendations to meet specifications or suggest the best method of installation.

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Hyde Park, Mass.

Ask for Catalog 180 V. 831 Offices in principal cities.

Steel and Radiation, Ltd., Toronto, Ont., is the corporate name of a recent merger of several Canadian companies, including the Standard Metal & Fireproofing Co., Toronto, and the King Radiator Co., of Toronto, manufacturer of the King Radiators and Ontario sales agents for the Daisy and Viking steam and hot water boilers. It is proposed to establish branches in a number of Canadian cities and to erect a new plant in Montreal to manufacture boilers, radiators and other supplies. The new company is capitalized at $5,000,000 and at present has plants in Toronto, Montreal and Winnipeg.

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., has issued $1,385,000 of additional preferred stock bearing interest at 7%, $1,000,000 of which is offered at par by Spencer Trask & Co., bankers, New York. The balance, $385,000, is to be used to retire existing issues of 6% first preferred and 7% second preferred stocks. The company will use the proceeds from the sale of $1,000,000 of the stock to provide additional working capital. The company's books show that full dividends have been paid on previous issues of preferred and common stock for 10 years without interruption.

William H. Burnham, president of the United States Supply Co., Omaha, Neb., and of the United States Water and Steam Supply Co., Kansas City, Mo., has been elected president of the H. R. Boynton Co., Los Angeles, Cal., to succeed the late H. R. Boynton.

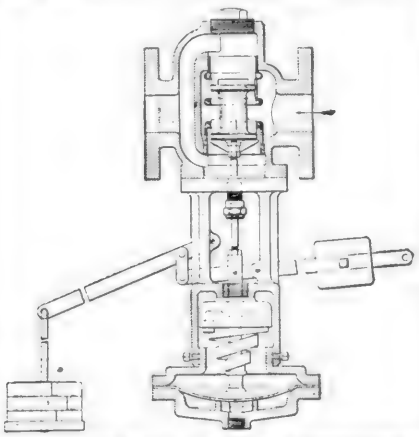
United States Radiator Corporation, Dunkirk, N. Y., announces the purchase of the Sodermann Heat & Power Co., of Edwardsville, Ill.

Crook-Horner Supply Co., Baltimore, Md., which succeeded the Crook-Horner Co., on September 1, has secured quarters at 7-11 Balderston street where it will continue as manufacturer and jobber of heating and plumbing supplies. President, W. H. Pitcher; vice-president, H. Kunnecke; second vice-president, Emile Boucher, secretary, J. C. Schusseler; treasurer, H. A. Booth.

New Firms and Business Changes

Story & Stephens, 150 Nassau street, New York, is a new partnership composed of Robert K. Story, of the late firm of Story & Beach, and Charles S. Stephens, until recently sales agent for the Wheeling Steel & Iron Co. The new firm will engage in business as manufacturers' agents for soil pipe and fittings, malleable iron fittings, brass fittings, plumbers' and steam fitters' brass and iron work, etc.

WATERS
Reducing Valves
for steam heating purposes a specialty.
Also valves for vacuum heating systems.



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CONVERT WASTE STEAM INTO PROFIT

With the J-M Sectional Conduit system, exhaust steam can be utilized for heating surrounding buildings, **thus converting waste into profit.**

It is the most efficient and economical method of conveying steam underground. Saves over 90% of heat lost in transmission through unprotected or poorly insulated pipes. Pays for itself in a short time in fuel and labor saved.

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Business Chances

Washington, D. C.—Bids will be received at the office of the Supervising Architect, Treasury Dept., for the following-named work:

Until November 23, 1910, for the extension, etc., except elevator, including plumbing, gas piping, heating apparatus, electric conduits and wiring system, of the U. S. Post Office at Rock Island, Ill.

Until December 1, 1910, for the heating and ventilating system in the New York Post Office (extended from Nov. 3, 1910).

Until December 8, 1910, for the construction, including plumbing, gas piping, heating apparatus and electric conduits and wiring of the U. S. Post Office at Granite City, Ill.

New Corporations

Climax Heating Co., Birmingham, Ala., capital $15,000, to manufacture heating devices. President, W. L. Bowman; general manager, E. G. Stafford; secretary and treasurer, S. J. Foster.

California Pipe & Steel Co., Bakersfield, Cal., capital stock $25,000. Incorporators: L. P. Welch, T. P. Finn, J. E. Graves and R. A. Finn.

W. W. Phillips Heating Co., Boston, capital $50,000, to manufacture heating apparatus. Incorporators: W. W. Phillips, Annie A. Phillips and Clarence G. Kellogg.

Bell Boiler Co., Dover, Del., capital $100,000, to manufacture boilers and heating supplies. The company's main office will be in Pittsburg.

Orchard Heater & Supply Co., Los Angeles, Cal., capital $10,000. Incorporators: A. P. Johnson, P. H. Booth, W. M. Dickie, F. H. Hammer and L. R. Wharton.

W. M. Coulson Co., Paducah, Ky., capital $15,000, to conduct a heating and plumbing business. Incorporators: W. M. Coulson and John Street.

Imperial Heater Co., Kansas City, Mo., capital $100,000, to manufacture house heating boilers. President, W. Z. Flannery; vice-president, R. S. Conwell; secretary and treasurer, R. L. Wilder.

Makin Heating Co., Philadelphia, whose incorporation was announced in our last issue, to take over the business of John A. Makin, has been capitalized at $25,000. Treasurer, Albert H. Dunn, Jr.; directors, John S. Makin, Albert H. Dunn, Jr., Robert F. Morgan, Charles Elmer Smith and Henry A. Schellman.

Royal Ventilator Co., Philadelphia, capital $25,000. Theasurer, William S. Furst; directors, George Orr, of Atlantic City, N. J., and William Patten, Jr., and Charles W. Lindsay, of Philadelphia.

National Hygienic Engineering Co., Philadelphia, capital $500,000, to manufacture machinery for sterlizing water and purifying air. The company is backed by capitalists in Wilmington, Del., where the plant will be located.

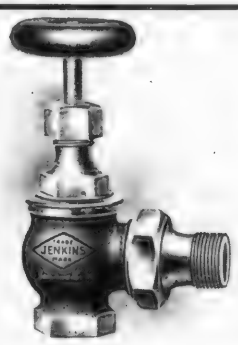
Silent Valve Co., Connersville, Ind., capital $200,000. Incorporators: Edward W. Ansted, E. L. Russell, Maynard M. Erb, Preston H. Kensler and Frank H. Ansted, all of Connersville.

Crane Plumbing Co., Fayetteville, N. C., capital $10,000, to conduct a heating and plumbing business. Incorporators: Benjamin McMillan, Harry S. McMillan and V. H. Crane.

California Steam Heating & Plumbing Supply Co., San Francisco, Cal., capital $100,000, to take over the business of the California Plumbing Supply Co., of that city.

McGregor Construction Co., Schnectady, N. Y., capital $5,000, to manufacture heating specialties. Incorporators: Thomas F. McGregor, Jean McGregor and L. B. Staley.

Snyder Plumbing Co., Norfolk, Va., to conduct a heating and plumbing business. President, J. J. Snyder; vice-president, George L. Snyder; secretary and treasurer, J. C. Snyder.



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Radiator Valves

The installation of these valves secures for your clients the heaviest radiator valves made. Highest grade metal and workmanship. Full opening. All parts renewable. Can be packed under pressure.

Jenkins Bros.

New York Boston Philadelphia Chicago

McElroy Plumbing & Engineering Co., Billings, Mont., capital $25,000, to conduct heating and plumbing business. Incorporators: J. H. McElroy, C. C. Tooker and W. H. Farrell.

Vulcan Heater & Tank Co., Chicago, capital $5,000. Incorporators: F. E. Bryan, C. A. Letz and A. Henderson.

McCune Valve Co., Boston, capital $50,000, to manufacture automatic valves. President, J. H. Norton, Brookline; treasurer, F. H. Carlisle, Malden.

Ozonizer Ventilating & Disinfecting Co., Uhrichsville, O., capital $10,000, to manufacture air purifying apparatus. Among the principals of the company is C. W. Rice, of Cleveland.

International Hygienic Co., Florence, Ala., capital $100,000. Incorporators: H. L. Stutts, E. J. Parker and J. M. Forsythe.

Metzger & Brayer Co., Rochester, N. Y., incorporated to conduct a heating and plumbing business. Directors: William J. Metzger, Albert Brayer and William Tillius, all of Rochester.

Contracts Awarded

W. J. Griffin Heating Co., Spokane, Wash., heating new Masonic Temple at Cœur d'Alene.

A. C. Schirmer Co., Hibbing, Minn., heating and plumbing new school building in the Fairview addition for $3,153.20.

Adams & Moffat Heating Co., Seattle, Wash., heating and ventilating new courthouse at Everett, Wash.

M. Isbister Heating and Plumbing Co., Spokane, Wash., heating and plumbing new Spokane Club building.

Bryce Heating and Ventilating Co., Toledo, O., heating and ventilating new high school at Peru, Ind., for $14,412; also Plymouth, Ind., high school and 8-room grade school annex for $12,952; also new high school at Mishawaka,

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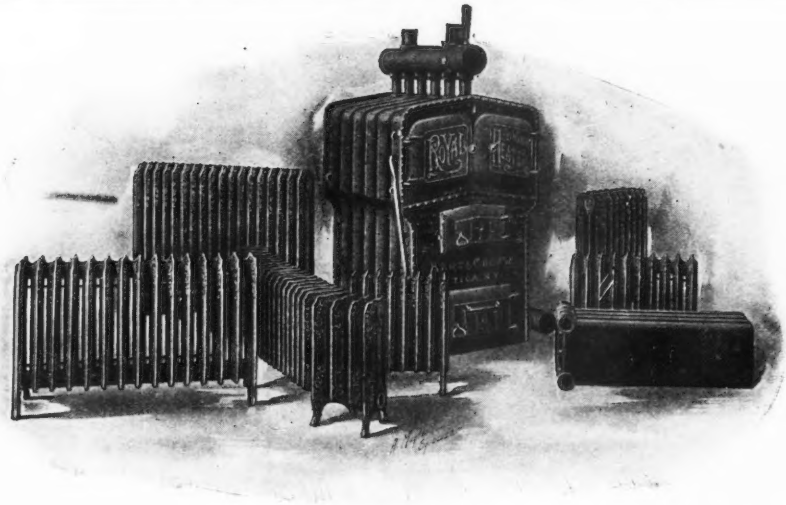
That's what Dixon's Pipe Joint Compound does and yet permits easy disconnection whenever this is desired.

JOSEPH DIXON CRUCIBLE COMPANY Jersey City, N. J.



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Ind., for $10,955. Other heating and ventilating plants being installed by this firm are for high school buildings in Hobart, Galveston, Orleans, Ind., and Logan, Athens and Matthews, O.

Purdy, Mansell & Co., Toronto, Ont., have been awarded the contract for the new ventilating system in the rebuilt portions of the Parliament buildings, which were burned; also in the new northern wing. The work will cost $50,000.

Logansport Heating Co., Logansport, Ind., has been awarded a contract to furnish heat to the county jail and courthouse for the ensuing year.

Bartlett Bros. Co., Cleveland, O., heating and ventilating new Brier Hill, Wood street and East Side schools in that city. The three contracts amount to $28,755.35.

Harrison Engineering Co., New York, heating and ventilating new building for the Buffalo Foundry & Machine Co., at Buffalo, N. Y.; also Keith's Theatre, Toledo, O., and the Mechanics Bank Building at New Haven, Conn. The Harrison Aertube System will be used in each installation.

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If you are the man we are looking for, this is an opportunity that has every element of success. The man that we want must be an up-to-date sheet metal worker, capable of acting in capacity of superintendent of construction for all kinds of sheet metal work and piping as applied to heating and ventilating.

Party with $5,000 to $10,000 can secure half-interest and official position in a $30,000 corporation, company to act as selling and erecting company for **established** manufacturer; profitable contracts assured from constant reliable source. A big opportunity for high-grade man. Replies treated confidential. Address, Illinois Blower Co., 1011-1013 Boyce Bldg., Chicago.

Position Wanted, by heating and ventilating engineer, technical graduate, eight years' practical experience in heating and ventilating public buildings, school houses and factories. The fan system a specialty. Address S, care of HEATING AND VENTILATING MAGAZINE.

After Jan. 1, 1911, can accept new position as heating and ventilating engineer. Eighteen years' practical experience on public buildings, both outside and inside work, steam, hot water and furnace. Mechanical ventilation a specialty. Will go anywhere in the United States. Chicago or Minneapolis preferred. Address E, care of HEATING AND VENTILATING MAGAZINE.

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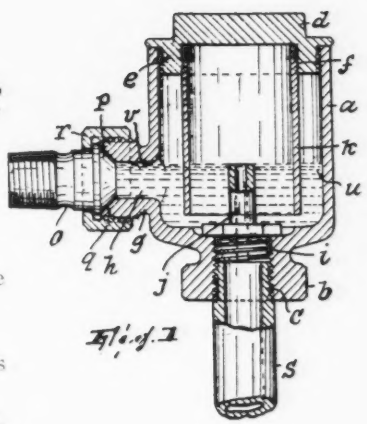
Automatic Relief Valve

For exhaust and low pressure steam heating



Expels all air and water from the radiator.
Can't get out of order.
Will stand as much pressure as standard fittings.
Parts easily cleaned if necessary.

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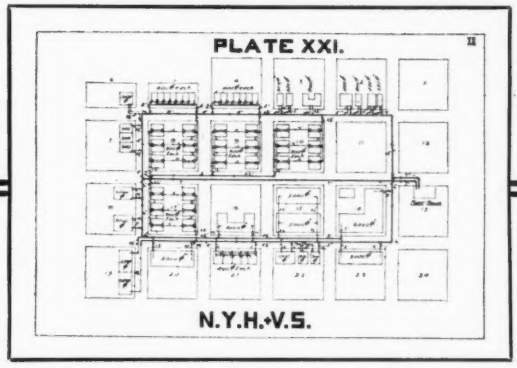

¶ This is one of the Lesson Sheets on Forced Hot Water Heating for a Central Station Town Heating in the Engineering Course of the

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Each lesson comprises from two to six of these sheets and includes

A Completely Laid Out Heating Plant.

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SEVENTEEN LESSONS IN THE COURSE

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Lesson 3—Low Pressure Steam, Two Pipe, Down Feed, Gravity Return System, Plant Isolated.
Lesson 4—Gravity Return Steam, Plant Isolated,
Lesson 5—Direct Steam Radiation System, with Mechanical Ventilation.
Lesson 6—School House System, Steam Hot Blast, One and Two Pipe.
Lesson 7—Steam Hot Blast, Factory.
Lesson 8—Steam Hot Blast, Round House.
Lesson 9—Forced Hot Water, Factory, Isolated Apparatus.
Lesson 10—Forced Hot Water, Group of Factory Buildings.
Lesson 11—Forced Hot Water, Office Building.
Lesson 12—Forced Hot Water, Central Station Town Heating.
Lesson 13—Forced Hot Water, School House Direct and Indirect,
Lesson 14—Aertube Hot Blast,
Lesson 15—Vacuum Heating Systems,
Lesson 16—Mechanical Draft, Economizers, and Fuel Consumption.
Lesson 17—General.

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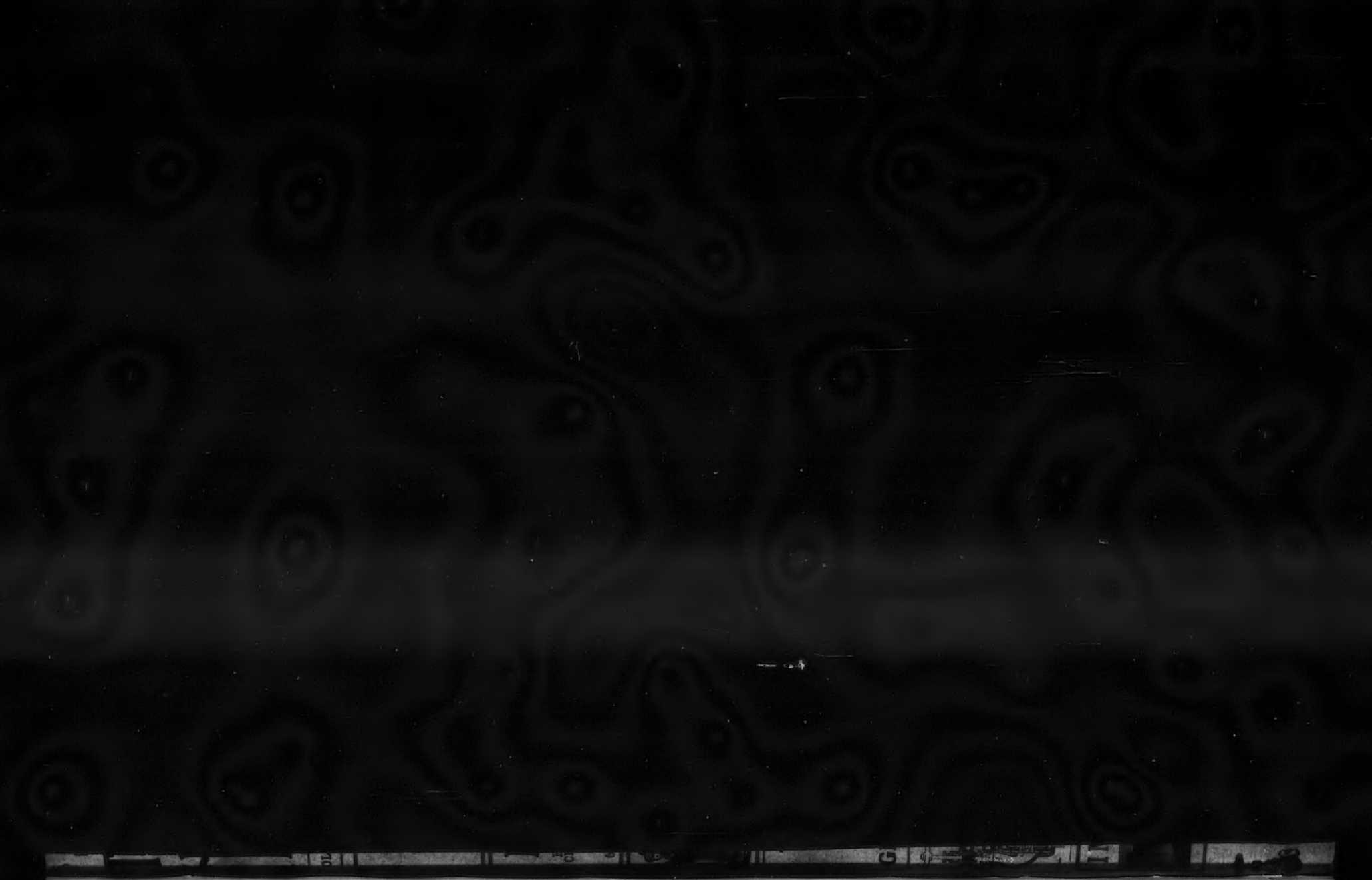
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